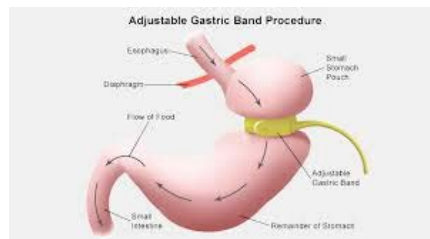


Bariatric surgery: Pathways, perspectives and policy options



by

Melanie Sharman

BPHE, Grad Dip (Ex Rehab), Grad Cert Res,
PhD candidate

**Submitted in fulfilment of the requirement for the Degree of Doctor of Philosophy
(Medical Research).**

March 2017



**UNIVERSITY of
TASMANIA**

MENZIES 
Institute for Medical Research

Supervisors

The work presented in this thesis was supervised by:

Primary supervisor

Professor Alison Jane Venn, PhD
Menzies Institute for Medical Research
University of Tasmania
Hobart, Australia

6th March, 2017

Co-supervisor

Professor Douglas Ezzy, PhD
School of Social Sciences
University of Tasmania
Hobart, Tasmania

27th February, 2017.

Co-supervisor

Professor Andrew John Palmer, MBBS
Menzies Institute for Medical Research
University of Tasmania
Hobart, Australia

27th February, 2017.

Declaration of Originality

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the thesis, nor does the thesis contain any material that infringes copyright.

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Name: Melanie Jayne Sharman

Signed:

Date: 22 March 2017

Statement of authorship

This thesis includes 5 manuscripts and one letter that have been co-authored, however, Melanie Jayne Sharman led the research for all manuscripts. Each co-author is listed below in alphabetical order alongside their respective institution:

Co-author	Institution
Blizzard L	Menzies Institute for Medical Research
Breslin MC	Menzies Institute for Medical Research
Campbell JA	Menzies Institute for Medical Research
Ezzy D	School of Social Sciences, University of Tasmania
Hensher M	Department of Health and Human Services, Tasmania
Jose KA	Menzies Institute for Medical Research
Kuzminov A	Menzies Institute for Medical Research
Palmer AJ	Menzies Institute for Medical Research
Venn AJ	Menzies Institute for Medical Research
Wilkinson S	Tasmanian Health Service
Williams D	School of Health Sciences, University of Tasmania

The contributions made by each author for each manuscript are detailed below.

1. Paper presented in Chapter 3

Sharman MJ, Breslin MC, Kuzminov A, Palmer AJ, Blizzard L, Hensher M, Venn AJ.

Population estimates and characteristics of Australians potentially eligible for bariatric surgery: findings from the 2011-13 Australian Health Survey. Aust Health Rev. 2017 (epub ahead of print)

Contribution from each author:

- Sharman MJ contributed to the conceptualisation of the study and study design, analysed data, interpreted the findings and compiled the manuscript
- Breslin MC contributed to the study design and acquisition of data, analysed data and critically reviewed the manuscript
- Kuzminov A contributed to the study design and acquisition of data, and critically reviewed the manuscript
- Palmer AJ contributed to the study design and critically reviewed the manuscript
- Blizzard L provided statistical expertise and critically reviewed the manuscript
- Hensher M contributed to the interpretation of the findings and critically reviewed the manuscript
- Venn AJ contributed to the conceptualisation of the study, study design, interpretation of the findings and critically reviewed the manuscript

2. Paper presented in Chapter 4

Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Review of publicly-funded bariatric surgery policy in Australia - lessons for more comprehensive policy making. Obes Surg. 2016; 26(4):817-824.

Contribution from each author:

- Sharman MJ contributed to the study design, acquired data, analysed data, interpreted the findings and compiled the manuscript
- Hensher M contributed to the acquisition of data and its interpretation and critically reviewed the manuscript
- Wilkinson S contributed to the interpretation of the findings and critically reviewed the manuscript
- Campbell JA checked the data extraction and critically reviewed the manuscript
- Venn AJ conceptualised the study, contributed to its design and interpretation of the findings and critically reviewed the manuscript

3. Paper presented in Chapter 5

Sharman MJ, Venn AJ, Hensher M, Wilkinson S, Palmer AJ, Williams D, Ezzy D.

Motivations for seeking bariatric surgery – the importance of health professionals and social networks. *Bariatric Surgical Practice and Patient Care*. 2016; 11(3): 104-109

Contribution from each author:

- Sharman MJ contributed to the study design, coordinated the study, acquired data, analysed data, interpreted the findings and compiled the manuscript
- Venn AJ conceptualised the study, contributed to the study design, data acquisition and interpretation and critically reviewed the manuscript
- Hensher M assisted with recruitment, data interpretation and critically reviewed the manuscript
- Wilkinson S assisted with recruitment, data interpretation and critically reviewed the manuscript

- Palmer AJ contributed to the study design and critically reviewed the manuscript
- Williams D contributed to the study design, data acquisition and interpretation and critically reviewed the manuscript
- Ezzy D contributed to the study design, data acquisition and interpretation, and critically reviewed the manuscript

4. **Paper presented in Chapter 6**

Sharman MJ, Hensher M, Wilkinson S, Williams D, Palmer AJ, Venn AJ, Ezzy D. What are the support experiences and needs of patients who have received bariatric surgery? *Health Expectations*. 2017; 20(1): 35-46.

Contribution from each author:

- Sharman MJ contributed to the study design, coordinated the study, acquired data, analysed data, interpreted the findings and compiled the manuscript
- Hensher M assisted with recruitment, data interpretation and critically reviewed the manuscript
- Wilkinson S assisted with recruitment, data interpretation and critically reviewed the manuscript
- Williams D contributed to the study design, data acquisition and interpretation and critically reviewed the manuscript
- Palmer AJ contributed to the study design and critically reviewed the manuscript
- Venn AJ conceptualised the study, contributed to the study design, data acquisition and interpretation and critically reviewed the manuscript
- Ezzy D contributed to the study design, data acquisition and interpretation, and critically reviewed the manuscript

5. Letter to the editor presented in Chapter 6

Sharman MJ, Hensher M, Wilkinson S, Kuzminov A, Ezzy D, Venn AJ. Emergency and pre-surgical band deflation in patients with laparoscopic adjustable gastric bands: variations in practice. ANZ Jnl Surg. 2015; 85(11): 890.

Contribution from each author:

- Sharman MJ contributed to the study design, coordinated the study, acquired data, analysed data, and compiled the manuscript
- Hensher M assisted with recruitment and data interpretation and critically reviewed the manuscript
- Kuzminov A critically reviewed and assisted with writing the manuscript
- Venn AJ conceptualised the study, contributed to the study design, data acquisition and interpretation and critically reviewed the manuscript
- Ezzy D contributed to the study design, data acquisition and interpretation and critically reviewed the manuscript

6. Paper presented in Chapter 7

Sharman MJ, Venn AJ, Jose KA, Williams D, Hensher M, Palmer AJ, Wilkinson S, Ezzy D. The support needs of patients waiting for publicly-funded bariatric surgery – implications for health service planning. Clinical Obesity (epub ahead of print)

- Sharman MJ contributed to the study design, coordinated the study, acquired data, analysed data, interpreted the findings and compiled the manuscript
- Venn AJ conceptualised the study, contributed to the study design, data acquisition and interpretation and critically reviewed the manuscript

- Jose KA contributed to the study design, acquisition and interpretation of data and critically reviewed the manuscript
- Williams D contributed to the study design, data acquisition and interpretation and critically reviewed the manuscript
- Hensher M assisted with recruitment, data interpretation and critically reviewed the manuscript
- Palmer AJ contributed to the study design and critically reviewed the manuscript
- Wilkinson S assisted with recruitment, data interpretation and critically reviewed the manuscript
- Ezzy D contributed to the study design, data acquisition and interpretation, and critically reviewed the manuscript

We the undersigned agree with the above stated “proportion of work undertaken” for each of the above published (or submitted) peer-reviewed manuscripts contributing to this thesis:

Signed:

Date: 02.03.17

06.03.17

Associate Professor Tracey Dickson
Associate Director Research
Menzies Institute for Medical Research
University of Tasmania

Professor Alison Venn
Principal Supervisor and Director
Menzies Institute for Medical Research
University of Tasmania

<i>Co-author</i>	<i>Signed</i>	<i>Date</i>
Blizzard L		1 March 2017
Breslin MC		2 March 2017
Campbell JA		1 March 2017
Ezzy D		27 Feb 2017
Hensher M		1 March 2017
Jose KA		1/3/2017
Kuzminov A		28/02/2017
Palmer AJ		27.02.2017
Wilkinson S		2/3/17
Williams D		28.02.17

Statement of ethical conduct

The research associated with this thesis abides by the international and Australian codes on human and animal experimentation, the guidelines by the Australian Government's Office of the Gene Technology Regulator and the rulings of the Safety, Ethics and Institutional Biosafety Committees of the University.

Name: Melanie Jayne Sharman

Signed:

Date: 22 March 2017

Acknowledgements

Firstly, I would like to acknowledge how lucky I am to be living in a country like Australia. A democratic country, free from war and opportunity abounds. I had the privilege of working in a brand new, purpose built research institute that provided me with everything I needed and more. I conducted this work without personal financial pressure because of funding provided by the university and the National Health and Medical Research Council and through generous donations made by members of the Tasmanian community who recognise the value of research. Thank you Australia.

Without excellent supervision I would never have achieved what I have. Thank you to my principal supervisor, Professor Alison Venn for being such an inspiration. You have so many admirable professional and personal qualities – an accomplished epidemiologist, a master facilitator, an infectious enthusiasm for research, a big heart and a wicked sense of humour. I have learnt so much from you. I really hope that this tough research environment does not prevent us from continuing to work together for many years to come.

To my co-supervisor, Professor Douglas Ezzy, thank you for introducing me to qualitative research. It was an incredibly rich experience conducting the focus group study and what a wonderful outcome that the sharing of people's stories made a difference. I was new to qualitative research when I commenced my PhD project and you were always so patient with me and your guidance was excellent. The timely and detailed emails you provided me were so helpful and something I referred back to many times (likewise your books). I am also grateful for the assistance you provided during the conduct of the focus groups and your regular offers of support.

To my second co-supervisor, Professor Andrew Palmer, thank you for exposing me to the fascinating world of health economics. I have really enjoyed the mixed methods nature of this

PhD project and combined with the mixed expertise in my supervisory team, this has provided an excellent platform for developing knowledge and skills across many fields. The value of health economics in a resource constrained public health system is unquestionable and this is an area I would like to study further.

There are many other people I would like to acknowledge that made a contribution to this work. This work was funded through a NHMRC partnership grant, which included the Departments of Health and Human Services and Premier and Cabinet as partners. It involved a multi-professional team, including experts in public health, policy makers, and primary and tertiary health professionals. This mix of professionals provided a valuable learning environment to enable an understanding of the diverse perspectives and needs of many professional groups involved in working with people experiencing obesity. I would like to specifically thank Martin Hensher and Dr Stephen Wilkinson for their intellectual input and practical assistance, especially regarding the policy review and focus group studies. Thank you to Dr Monique Breslin for your untiring support and assistance working with the Australian Health Survey data. We faced many challenges working with these data and you never wavered in your enthusiasm to overcome them. To Julie, Alex, Michelle and Kim (the post-doc and PhD team) I am very fond of you all. What a treat to be surrounded by such lovely and intelligent people committed to good research and trying to improve the lives of those experiencing obesity.

I would also like to acknowledge my beautiful family and many wonderful friends who through various ways have supported me through this 3.5 year-long project. My partner, Professor James Sharman, who I admire very much as a person and researcher. Thank you for recommending that I should do a PhD with Alison – what a wise man you are! My gorgeous 10-year-old daughter who has taught me to be extremely efficient and organised, because you never know what might happen tomorrow! Thank you dear girl for sometimes showing

interest in my work - 'jeez that looks really boring mum'. To my friends and family members who were sincerely interested in the work I was doing, some of whom even wanted to read my papers – what treasures (mum, Philippa, Michael, Marie, Anna and Melinda that is you).

Finally, to the many people whose weight is negatively affecting their lives. I have done the best job I could to ensure that the work I completed made a difference. This opportunity was never taken for granted.

With much gratitude,

Melanie Sharman

PhD candidate (public health)

Abstract

Background

Bariatric surgery is the most effective treatment for obesity in adults, but providing equitable access to this service is a challenge in resource constrained public health systems (>90% of bariatric surgery is privately-funded in Australia, with 18,890 primary bariatric surgeries conducted through the private system in 2016). In the presence of many evidence gaps, health service planners face difficult decisions in determining how many primary bariatric surgery procedures should be funded, who should be prioritised and which models of care are needed. The Tasmanian department of Health and Human Services sought assistance from the University of Tasmania, to fill knowledge gaps needed to inform evidence based policy and service delivery of bariatric surgery.

Aims

The three principal aims of this PhD project were to:

1. Estimate the number and characteristics of adult Australians in each state and territory potentially eligible for bariatric surgery and the potential demand for this service through the public and private health systems.
2. Compare jurisdictional and national level guidance on bariatric surgery and provide recommendations for future policy development.
3. Provide advice on service delivery models based on knowledge of why people seek surgery, patient perspectives on the impact of prolonged waits for surgery and the support needs of bariatric surgery recipients.

Methods

Aim 1: 2011-13 Australian Health Survey data was extracted to estimate the number and characteristics of those potentially eligible for bariatric surgery. Aim 2: National (Australia, UK and US) and Australian state and territory guidelines on bariatric surgery were reviewed and compared. Aim 3: The pre- and post-bariatric surgery patient experience was thematically analysed following ten semi-structured focus groups and 19 individual interviews, involving recipients of bariatric surgery and patients waiting for surgery.

Results

Of the 3,352,037 adult Australians (18-65 years) estimated to be living with obesity in 2011-13, 882,441 (26.3%) were potentially eligible for bariatric surgery (6.2%; CI 5.4, 7.1 of the adult population aged 18-65 (n=14,122,020)), of which 45.8% were without private health insurance (Aim 1). National and jurisdictional guidelines were not uniform (e.g. access criteria were inconsistent) and there was limited or no guidance on prioritisation of eligible patients and follow-up surgical services (e.g. reoperations and removal of excess skin) (Aim 2). Patients waiting for surgery and those who had undergone surgery (n=68), identified many support gaps (e.g. deficits in psychological, peer and dietetic support and follow up surgical services), that may influence their outcomes (Aim 3).

Conclusions

The potential demand for bariatric surgery in Australia far outstrips the current supply of this service especially through the public health system, indicating a need for more resourcing of this service and other effective interventions. Determining who should have priority for the limited resource of bariatric surgery in the public health system is challenging and is made more difficult because guidelines on this intervention are inconsistent and are generally silent on some key policy issues (e.g. patient prioritisation), highlighting a need for policy renewal.

Models of care for bariatric surgery should reflect pre- and post-surgical support needs of patients (e.g. dietetic, psychological, peer support and follow-up surgical services), because the support experience may influence outcomes. The challenge lies in determining how a public health system can provide better support with limited resources. Future research designed to assist patient prioritisation decisions and to determine the most efficacious and cost-effective models of care is needed, ideally leading to better service delivery of bariatric surgery and improved patient outcomes.

Structure of this thesis

This thesis provides much needed information for health service planners to inform policy and service delivery of bariatric surgery, particularly in Tasmania. Chapter 1 provides an overview of bariatric surgery as a treatment option for obesity and identifies knowledge gaps that need to be filled to assist health service planners with their decision making. Chapters 3-7 provide the study findings, the studies of which were designed to fill some of the knowledge gaps identified. Chapter 3 is concerned with estimating the potential demand for bariatric surgery in Australia. Chapter 4 provides a review of national and Australian state and territory level guidance on bariatric surgery and recommendations for policy renewal. Chapter 5 identifies the reasons why Tasmanians seek bariatric surgery and Chapters 6 and 7 highlight the support needs of those following or waiting for bariatric surgery in Tasmania. Together, these findings can be used to inform bariatric surgery models of care. Chapter 8 provides a summary of the findings and their implications for health service planning and where future research is needed.

Please note that the published papers in Chapters 3-7 have been slightly modified for presentation consistency.

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List of abbreviations

ACR	albumin creatinine ratio
ACT	Australian Capital Territory
AGB	adjustable gastric band
AHS	Australian Health Survey
ALT	alanine aminotransferase
BMI	body mass index
BP	blood pressure
BPD	biliopancreatic diversion/duodenal switch
CI	confidence intervals
CV	cardiovascular
CVD	cardiovascular disease
ED	emergency department
eGFR	estimated glomerular filtration rate
EWL	excess weight loss
F	female
FPG	fasting plasma glucose
GORD	gastroesophageal reflux disease
GP	general practitioner
HbA1c	haemoglobin A1c
HDL	high-density lipoprotein
LAGB	laparoscopic adjustable gastric band
M	male
NASH	non-alcoholic steatohepatitis
NHS	National Health Survey
NHMRC	National Health and Medical Research Council
NHMS	National Health Measures Survey
NNPAS	National Nutrition and Physical Activity Survey
NSW	New South Wales
NT	Northern Territory

OA	osteoarthritis
QLD	Queensland
PCOS	polycystic ovarian syndrome
PS	post-surgery
RR	relative risk
RYGB	roux-en-Y gastric bypass
SA	South Australia
SG	sleeve gastrectomy
TAS	Tasmania
T1DM	type 1 diabetes mellitus
T2DM	type 2 diabetes mellitus
VIC	Victoria
WA	Western Australia
WL	wait list
WT	wait time

Chapter 1: Introduction

Definition and prevalence of obesity

Obesity is commonly defined as having a body mass index (BMI) (weight/height^2) $\geq 30.0 \text{ kg/m}^2$ and is categorised into three classes: Class 1 (BMI $30.0 - 34.9 \text{ kg/m}^2$); Class 2 (BMI $35 - 39.9 \text{ kg/m}^2$) and Class 3 (BMI $\geq 40 \text{ kg/m}^2$) (1). Less frequently, obesity may be estimated through other anthropometric measures (e.g. skinfold thickness, waist circumference, waist-hip ratio) or through use of imaging (e.g. magnetic resonance imaging, computerised tomography) (2, 3). Waist circumference and waist-hip ratio are simple tools that can be used in clinical practice in addition to BMI to refine risk assessment of obesity related disease (e.g. diabetes and cardiovascular disease) (1, 3, 4).

The global prevalence of obesity in adults in 2008 was estimated to be 502 million (14% of adult women and 10% of adult men) which is expected to increase to 573 million by 2030 (5, 6). In the period 2011-12, four million adult Australians or 27.2% of the adult population were estimated to be living with obesity, the prevalence of which was similar between men and women (7). However, women were over-represented in the higher categories of obesity (6.9% and 4.2% of adult women had class 2 or 3 obesity respectively compared with 2.0% and 5.9% of adult men) (7). These sex differences may be partly explained by the relationship between higher BMI and socioeconomic disadvantage (7), but other factors may also play a role, (e.g. those that are sociocultural such as physical activity patterns) (8).

The cause and public health impact of obesity

A chronic imbalance between energy consumed and energy expended is now recognised as an inadequate explanation of the cause of obesity. Instead, obesity is considered a complex problem (9) resulting from an interplay between physiological, psychological, societal, environmental and economic factors, which individually and collectively contribute to

individual and societal levels of obesity in different ways (1, 10, 11). Obesity is a significant public health concern because it is a risk factor for many non-communicable diseases and disability (e.g. type 2 diabetes mellitus (T2DM), most cancers, cardiovascular disease, asthma, gallbladder disease, osteoarthritis and chronic back pain (12)). The risk of disease and consequent health service use increases as the level of obesity rises (13, 14).

In 2014, the impact of obesity on global domestic product was assessed at \$2.0 trillion (2014 dollars at purchasing-power parity), third to both smoking and armed combat at \$2.1 trillion each (15). In 2008, the annual cost of obesity to the Australian economy was valued at AUD \$58.2 billion accounting for indirect (e.g. productivity), direct (e.g. health system use) and loss in well-being costs (16). Despite many countries being engaged in population level initiatives to prevent or reduce the prevalence of obesity e.g. better food labelling (17), food advertising restrictions (18), taxes on non-essential energy dense foods (19), no country has been successful in its efforts to turn around its obesity epidemic (9). Subsequently, calls for more action by industry, government and civil society have recently been made (9).

There has been much debate about whether obesity is a disease and the implications of labelling it as such (e.g. diminished self-responsibility, greater health system burden) (20). Despite some negative sentiments, in recent times many reputable professional bodies have officially recognised obesity as a disease (e.g. The American Medical Association, World Health Organisation), with the World Obesity Federation also emphasising its relapsing nature (2, 20). It is envisaged that changing the frame of reference of obesity in this way will help mobilise the multi-sectoral support needed to combat it (2, 20).

Individual weight loss options

At an individual level there are three weight loss options for those experiencing obesity – lifestyle modification (e.g. improved diet and physical activity levels); medical management

(e.g. pharmacotherapy); and bariatric surgery (where either the size of the stomach is reduced or part of the small intestine is bypassed - see 'Types and mechanisms of bariatric surgery' below). For the vast majority, weight loss through lifestyle modification or medical management is generally modest (3-5kg) and unlikely to be sustained (1, 21, 22). Conversely, a recent systematic review of clinical trials (n=7) concluded that bariatric surgery confers greater weight reductions (e.g. on average 22.7 kg (23)), improvements in obesity related comorbidity (e.g. T2DM (24)) and some aspects of quality of life (23, 25) when compared with non-surgical weight loss interventions until 2 years post intervention (26). The enduring impact of bariatric surgery needs to be substantiated through high quality clinical trials reporting longer term outcomes (27), although findings from observational studies with longer term follow up (up to 20 years (28, 29)) show promise e.g. regarding weight loss (Figure 1) and mortality outcomes (Figure 2). Additional reported benefits from bariatric surgery subsequent to weight loss (but less commonly measured outcomes) included a greater capacity to engage in physical activity, reduced work absenteeism and use of the disability pension (30). Consequently, the provision of bariatric surgery has increased significantly worldwide in recent times (468, 609 procedures estimated to be performed internationally in 2013 compared with 142,241 in 2003) (31). In Australia 16,650 bariatric surgeries were performed in 2015, up from 5,669 in 2005 (32, 33).

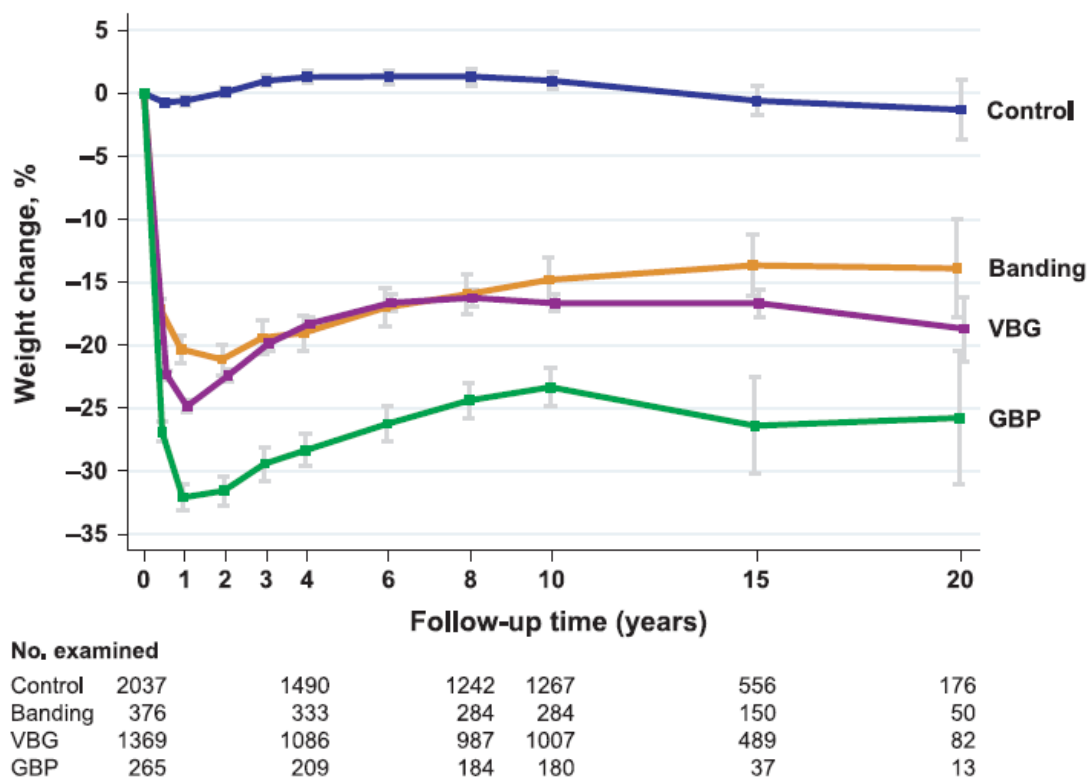
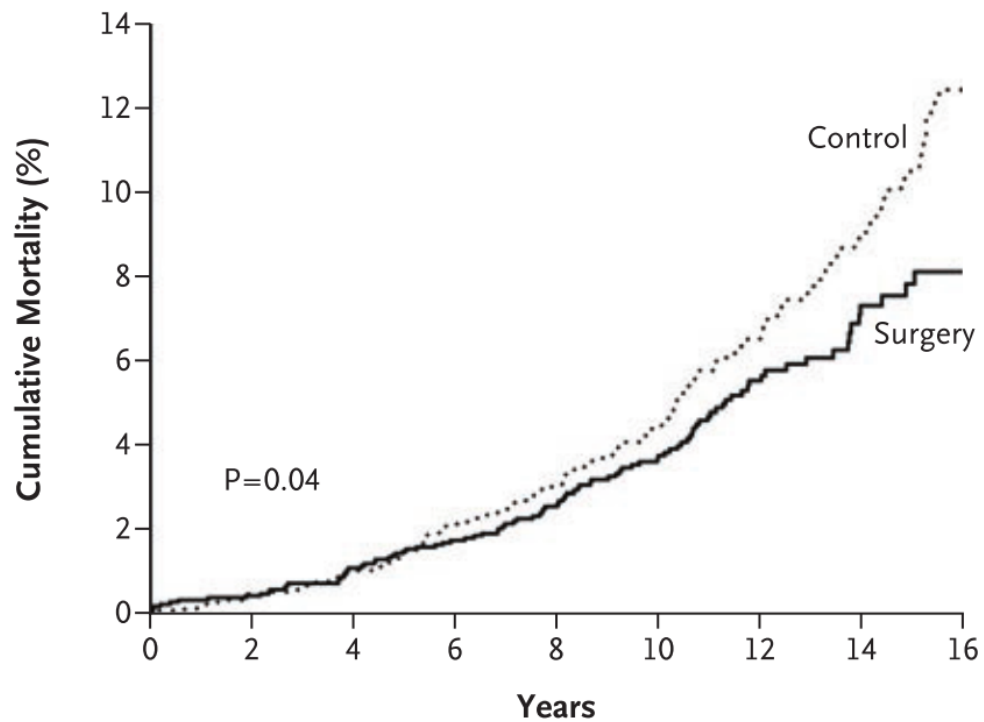


Figure 1: Weight changes following three different types of bariatric surgery compared with controls up to 20 years. Key: Banding - adjustable gastric band; GBP gastric bypass; VBG vertical banded gastroplasty. Source: Sjostrom et al, 2013. Journal of Internal Medicine (29).



No. at Risk

Surgery	2010	2001	1987	1821	1590	1260	760	422	169
Control	2037	2027	2016	1842	1455	1174	749	422	156

Figure 2: Mortality risk up to 16 years following bariatric surgery compared with controls.

Source: Sjostrom et al, 2007. New England Journal of Medicine (34).

Types and mechanisms of bariatric surgery

The most common types of bariatric surgery conducted globally in descending order of frequency are Roux-en-y gastric bypass (RYGB), sleeve gastrectomy (SG) and adjustable gastric banding (AGB) (31). RYGB involves moving part of the jejunum (the middle portion of the small intestine) and attaching it to a newly formed pouch at the proximal aspect of the stomach. Food then bypasses most of the stomach, duodenum and proximal jejunum (35) (Figure 3). With SG up to 80% of the lateral aspect of the stomach is removed (36) (Figure 4). AGB involves placing an adjustable band around the proximal aspect of the stomach that creates a small pouch above it. The tension of the band can be adjusted through an access port

that sits subcutaneously at the level of the abdomen (36) (Figure 5).

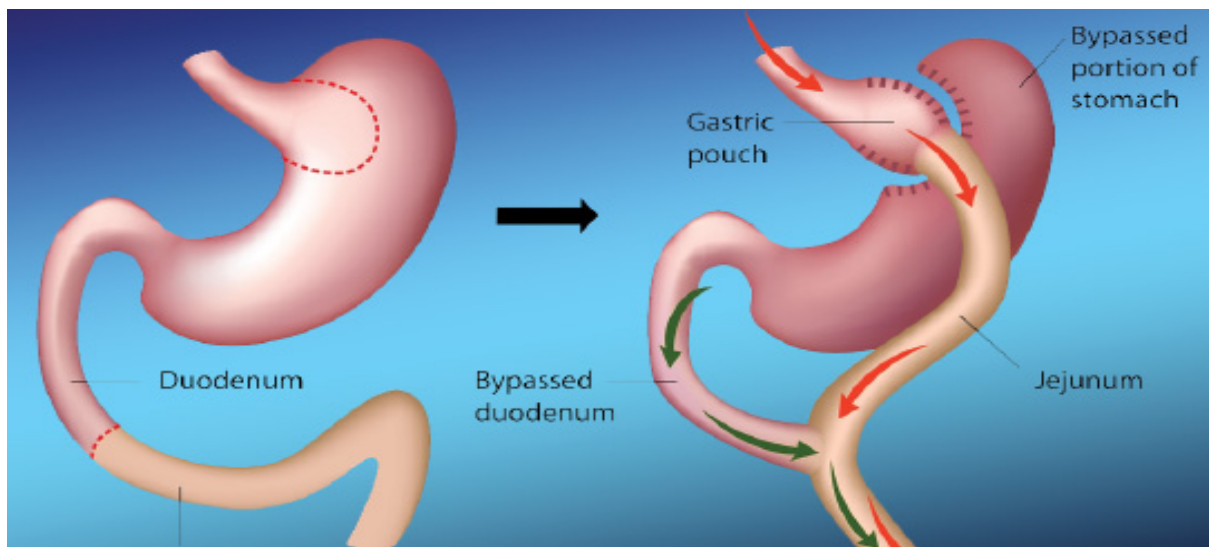


Figure 3: Diagrammatic representation of roux-en-y gastric bypass (RYGB). Source:

<http://www.saintlukeshospitals.com/roux-en-y-gastric-bypass.php>

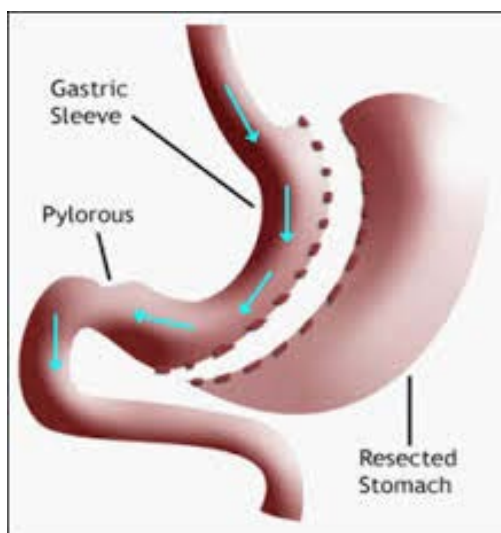


Figure 4: Diagrammatic representation of sleeve gastrectomy (SG). Source:

<http://www.portlapsurgery.com.au/the-emotional-journey-to-a-sleeve-gastrectomy/>

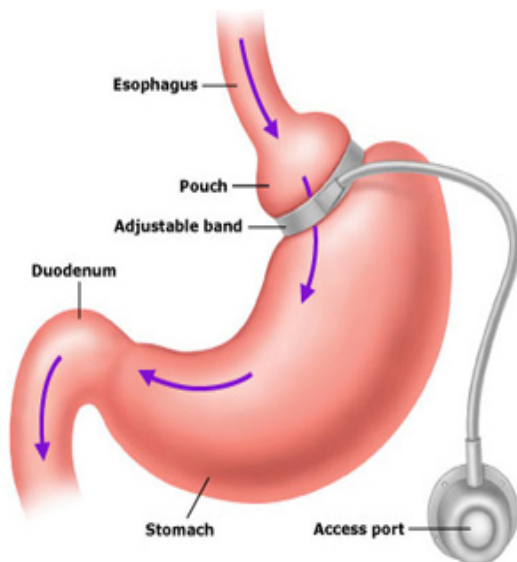


Figure 5: Diagrammatic representation of the adjustable gastric band (AGB). Source:

http://www.lapgastricband.com.au/gastric_band.html

The relatively new SG procedure (first described in the literature in 1998 (37)) has become the preferred surgical type in the USA/Canada and Asia/Pacific regions including within Australia (31, 32). The primary advantages of SG, are that it is a simpler and faster procedure to perform compared with RYGB, less dietary change is required compared with both RYGB and AGB (38) and it appears to have a lower reoperation rate than AGB (39). A systematic review of clinical trials (reporting outcome data up to 3 years) demonstrated that weight loss and comorbidity improvement in RYGB compared with SG were comparable and both were superior to AGB (26). One clinical trial that reported on longer term outcomes of SG (up to 5 years) (40) found that when comparing SG and RYGB, weight loss was greater following RYGB, but safety and quality of life and comorbidity improvement were similar. Two recently initiated clinical trials comparing SG and RYGB over 5 years (38, 41) will provide needed additional information about the longer terms effects of SG (27).

Originally, the efficacy of bariatric surgery was thought to be due to reduced food intake (e.g. via AGB or SG) or nutrient malabsorption (e.g. via RYGB) (36). Depending on the procedure used, the efficacy of bariatric surgery appears more likely to be a result of reduced hunger,

increased satiety, changed food preferences (e.g. less desire for calorie dense foods) or augmented diet-induced energy expenditure (36), but more research is needed to fully understand the mechanisms involved.

Eligibility for bariatric surgery

Bariatric surgery is generally not recommended to all people experiencing obesity. It is more commonly recommended to be considered for adults (aged 18-65 years) with resistant class 3 obesity or; class 2 obesity in the presence of obesity related comorbidity (e.g. T2DM, hypertension, kidney disease, sleep apnoea, osteoarthritis, non-alcoholic steatohepatitis, gastro-oesophageal reflux disease) (1). More recently it has been recommended for those adults with class 1 obesity in the presence of T2DM (1, 42-44), because of high quality evidence (albeit limited to medium term outcomes) that bariatric surgery positively influences metabolic health in most people (29, 45-47). For example, a systematic review and meta-analysis of 621 studies with a total sample size of 135,246, demonstrated that bariatric surgery confers significant improvements in metabolic health for most people, which may continue for more than 2 years (45) (Table 1). In fact, because of the positive impact bariatric surgery can have on metabolic health, its inclusion in the treatment algorithm of T2DM has recently been widely endorsed (47). Although, a recent systematic review of health economic evaluations of bariatric surgery concluded that based on available evidence, bariatric surgery could only be determined as cost effective (and also cost saving) for those with \geq class 2 obesity with T2DM (48).

Further, bariatric surgery is now viewed as an effective treatment for adolescents and older adults with obesity (30, 49, 50), consequently it is likely that more surgery will be conducted in these age groups in the future. However, trial evidence reporting hard outcomes for both population groups is needed (50-52). Of particular importance is knowing whether the longer

term outcomes of bariatric surgery in adults are similar in teenagers, given differences in physical, psychosocial and behavioural characteristics between these population groups (51).

Table 1: Weight loss and diabetes resolution by different bariatric surgery procedures

	Total	Gastric Banding	Gastroplasty	Gastric Bypass	BPD/DS
% EBWL	55.9	46.2	55.5	59.7	63.6
% Resolved overall	78.1	56.7	79.7	80.3	95.1
% Resolved <2 y	80.3	55.0	81.4	81.6	94.0
% Resolved ≥2 y	74.6	58.3	77.5	70.9	95.9

Key: BPD/DS biliopancreatic diversion with duodenal switch; EBWL excess body weight loss. “Resolved” refers to diabetes resolution. Source: Buchwald et al, 2009. The American Journal of Medicine (45).

Risks of bariatric surgery

Complications can result from bariatric surgery. According to one systematic review of clinical trials (n=37) and observational studies (n=127), bariatric surgery had a mortality rate of 0.08% within 30 days and 0.31% after 30 days, a complication rate of 17% (e.g. bleeding, vomiting, reflux, gastrointestinal symptoms, leakages) and a reoperation rate of 7% (39). A prospective study of 4776 patients who had undergone RYGB or AGB found that a history of deep-vein thrombosis or pulmonary embolus, obstructive sleep apnoea, impaired functional status and extremely high BMI were independently associated with death or major adverse outcomes within 30 days of surgery (53).

Re-operative bariatric surgery (surgical correction or conversion of one procedure to another such as AGB to SG) occurs due to complications or because of insufficient weight loss or improvement in obesity-related comorbidity (54). Although AGB appears to have a relatively low complication rate compared with some other procedures (13% versus 21% after RYGB (39)), it appears to have a high reoperation rate (12% versus 3% following RYGB (39)). Additionally, reoperations are associated with a higher complication rate compared with primary bariatric surgery (54). The longer-term complication profile of the various bariatric surgery procedures is less clear (28). More research is needed regarding other potential associated complications, for example, those related to excess skin subsequent to rapid weight loss, increased fracture risk due to losses in bone mineral density (55), increased suicide risk and disordered alcohol use (56, 57), and some unfavourable pregnancy outcomes (e.g. shorter gestation length, small for gestational age and possibly increased infant mortality risk (58)). These potential longer term consequences of bariatric surgery also need to be considered in health economic analyses (48).

Factors influencing surgical outcomes

Determining the factors that can predict whether a patient will have success or not subsequent to bariatric surgery is important. Heterogeneity across relevant studies (e.g. variable definitions of predictors and use of evaluation tools (59)) makes it difficult to formulate robust conclusions, but pre-operative factors that may contribute to better outcomes include pre-surgery weight loss (59), lower BMI (59, 60) and the absence of psychological disorders (59). Only one study has investigated the relationship between the motivations for seeking surgery and surgical outcomes and found no effect 1-3 years post intervention, although the unselected recruitment approach may have confounded the findings (61).

Post-operative factors that may contribute to weight regain include both those that are surgery and patient oriented (psychological and behavioural), such as surgical complications, physical

inactivity, poor mental health, lack of favourable hormonal alteration, and non-compliance with requisite dietary change (62). For example, for some procedures (e.g. RYGB and AGB) dietary modification is requisite to avoid complications (63). In the case of RYGB, dumping syndrome is relatively common (estimated prevalence 9.4% (64)), resulting from the consumption of concentrated sugar which passes through the stomach too quickly and manifests as diarrhoea, cold sweats and nausea (65). Consuming certain types of foods (e.g. bread, tough meats, rice and pasta) that have been inadequately prepared for those with an AGB can result in blockages at the site of the band and may result in emergency presentations for band deflation (66).

Given the diversity and the number of factors that can influence the outcomes of bariatric surgery and the significant and endured behavioural change needed post-surgery, multidisciplinary support across the life of the intervention is recommended (1, 42, 43, 63). However, allied health professionals such as psychologists and dietitians are not uniformly included in models of care despite contrary recommendations (67, 68). Further, it is uncertain to what extent patients receive the pre and post-surgical support they need or want and how the support experience may influence outcomes.

Accessing bariatric surgery

Funding models for bariatric surgery vary internationally (69), but according to a recent systematic review of 12 retrospective cohort studies (from US, UK, Canada and Australia), of those potentially eligible for surgery, the 1-5% who received surgery were more likely to have private health insurance (70). They were also more likely to be female, white and of middle socio-economic status (70). In Australia, > 90% of bariatric surgery is privately-funded, with 16,650 primary surgeries conducted through the private system in 2015 (32, 71). This is despite obesity being more prevalent in areas of socio-economic disadvantage (7) and

outcomes appearing to be comparable between surgery funding types (72-74). Like elsewhere (e.g. Canada) there is evidence of long wait times for publicly-funded bariatric surgery in Australia (75-77), but the economic, clinical, and psychosocial consequences of these long waits and the patient prioritisation implications are uncertain (78). The extent to which the supply of bariatric surgery is falling short of demand, especially in the Australian public health system is also unknown. Although, there were methodological limitations (e.g. selection bias), a Canadian based questionnaire study found that 23% of patients (87 of 371) enrolled in a publicly-funded weight loss program who were deemed eligible for bariatric surgery were interested in pursuing a surgical pathway (79).

Health service planning for bariatric surgery

In countries where public health systems are operating under resource constraints and in the presence of important knowledge gaps, health service planners are faced with difficult decisions in determining how much publicly-funded bariatric surgery to conduct, who should have priority and the best models of care to use. The Department of Health and Human Services sought assistance from researchers at the University of Tasmania to fill knowledge gaps needed to optimise bariatric surgery service delivery (e.g. estimated service demand, bariatric surgery guideline consensus on key policy issues such as access and prioritisation criteria and the best models of care to use). Tasmania is an island state of Australia, estimated to have an adult population (aged ≥ 18 years) of 328,100 in the period 2011-12, of which 91,000 adults were classified as living with obesity (80). Approximately 450 primary bariatric surgery procedures (principally AGB) are conducted per year within three private hospitals and two public hospitals, although most (~ 95%) are privately funded (76, 81).

Aims of this PhD

The objectives of this PhD project were to:

- Quantify and characterise the Australian population potentially eligible for bariatric surgery in each state and territory based on criteria recommended by the National Health and Medical Research Council in guidelines on obesity management (67) and estimate the potential demand for this service through the public and private health systems.
- Compare jurisdictional and national level guidance on bariatric surgery and provide recommendations for future policy development.
- Provide advice on service delivery models based on knowledge of why people seek surgery, patient perspectives on the impact of prolonged waits for surgery and the support needs of bariatric surgery recipients.

Summary of scholarly output and recognition

This PhD project has resulted in six publications (Chapters 3-7) and key findings have been presented at least once at national and international conferences (Appendix 1). On two occasions the work presented (bariatric surgery policy review and estimates of potential demand for bariatric surgery in chapters 3 and 4 respectively) was awarded a prize (best poster and best paper respectively). Competitive funding was granted to present three papers at the inaugural European Obesity Summit in Sweden in 2016. Relevant findings have also been presented in other contexts as detailed in Appendix 1. Additionally, the importance of the bariatric surgery policy review findings was recognised at the Victoria/Tasmania Royal Australasian College of Surgeons Meeting held in Hobart, October 2015, where the work was selected for their media release promoting the event. An interview with the Tasmanian newspaper, The Mercury, followed this meeting. Other related scholarly output external to this PhD project is detailed in Appendix 2.

References

1. National Health and Medical Research Council. Clinical practice guidelines for the management of overweight and obesity in adults, adolescents and children in Australia. Melbourne; 2013.
2. Bray GA, Kim KK, Wilding JPH. Obesity: a chronic relapsing progressive disease process. A position statement of the World Obesity Federation. *Obes Rev.* 2017;18(7):715-23.
3. de Koning L, Merchant AT, Pogue J, Anand SS. Waist circumference and waist-to-hip ratio as predictors of cardiovascular events: meta-regression analysis of prospective studies. *Eur Heart J.* 2007;28(7):850-6.
4. Cerhan JR, Moore SC, Jacobs EJ, Kitahara CM, Rosenberg PS, Adami HO, et al. A pooled analysis of waist circumference and mortality in 650,000 adults. *Mayo Clin Proc.* 2014;89(3):335-45.
5. Kelly T, Yang W, Chen CS, Reynolds K, He J. Global burden of obesity in 2005 and projections to 2030. *Int J Obes.* 2008;32(9):1431-7.
6. World Health Organisation. Obesity: Situation and trends 2016 [updated 2016. Available from: http://www.who.int/gho/ncd/risk_factors/obesity_text/en/.
7. Keating C, Backholer K, Gearon E, Stevenson C, Swinburn B, Moodie M, et al. Prevalence of class-I, class-II and class-III obesity in Australian adults between 1995 and 2011-12. *Obes Res Clin Pract.* 2015;9(6):553-62.
8. Kanter R, Caballero B. Global Gender Disparities in Obesity: A Review. *Advances in Nutrition: An International Review Journal.* 2012;3(4):491-8.
9. Roberto CA, Swinburn B, Hawkes C, Huang TTK, Costa SA, Ashe M, et al. Patchy progress on obesity prevention: emerging examples, entrenched barriers, and new thinking. *The Lancet.* 385(9985):2400-9.
10. Government of Victoria - Department of Human Services. Surgery for morbid obesity. Framework for bariatric surgery in Victoria's public hospitals. Melbourne; 2009.
11. Church TS, Thomas DM, Tudor-Locke C, Katzmarzyk PT, Earnest CP, Rodarte RQ, et al. Trends over 5 decades in U.S. occupation-related physical activity and their associations with obesity. *PLOS One.* 2011;6(5):25.
12. Guh DP, Zhang W, Bansback N, Amarsi Z, Birmingham CL, Anis AH. The incidence of co-morbidities related to obesity and overweight: a systematic review and meta-analysis. *BMC Public Health.* 2009;9:88.
13. Must A, Spadano J, Coakley EH, Field AE, Colditz G, Dietz WH. The disease burden associated with overweight and obesity. *JAMA.* 1999;282(16):1523-9.
14. Wang F, McDonald T, Bender J, Reffitt B, Miller A, Edington DW. Association of healthcare costs with per unit body mass index increase. *J Occup Environ Med.* 2006;48(7):668-74.
15. McKinsey Global Institute. Overcoming obesity: An initial economic analysis. New York; 2014.
16. Access Economics. The growing cost of obesity in 2008: 3 years on. Canberra: Diabetes Australia; 2008.
17. Hawley KL, Roberto CA, Bragg MA, Liu PJ, Schwartz MB, Brownell KD. The science on front-of-package food labels. *Public Health Nutr.* 2013;16(3):430-9.
18. Campos D, Hernandez-Torres JJ, Agil A, Comino M, Lopez JC, Macias V, et al. Analysis of food advertising to children on Spanish television: probing exposure to television marketing. *Archives of medical science : AMS.* 2016;12(4):799-807.

19. Batis C, Rivera JA, Popkin BM, Taillie LS. First-Year Evaluation of Mexico's Tax on Nonessential Energy-Dense Foods: An Observational Study. *PLoS medicine*. 2016;13(7):e1002057.
20. The Lancet Diabetes and Endocrinology. Should we officially recognise obesity as a disease? *The Lancet Diabetes & Endocrinology*. 2017;5(7):483.
21. Jain A. Treating obesity in individuals and populations. *British Medical Journal*. 2005;331:1387-90.
22. Padwal R, Li SK, Lau DC. Long-term pharmacotherapy for overweight and obesity: a systematic review and meta-analysis of randomized controlled trials. *Int J Obes Relat Metab Disord*. 2003;27(12):1437-46.
23. Dixon JB, Schachter LM, O'Brien PE, Jones K, Grima M, Lambert G, et al. Surgical vs conventional therapy for weight loss treatment of obstructive sleep apnea: a randomized controlled trial. *Jama*. 2012;308(11):1142-9.
24. Dixon JB, O'Brien PE, Playfair J, Chapman L, Schachter LM, Skinner S, et al. Adjustable gastric banding and conventional therapy for type 2 diabetes: a randomized controlled trial. *JAMA*. 2008;299(3):316-23.
25. O'Brien PE, Dixon JB, Laurie C, Skinner S, Proietto J, McNeil J, et al. Treatment of mild to moderate obesity with laparoscopic adjustable gastric banding or an intensive medical program: a randomized trial. *Ann Intern Med*. 2006;144(9):625-33.
26. Colquitt JL, Pickett K, Loveman E, Frampton GK. Surgery for weight loss in adults. *Cochrane Database Syst Rev*. 2014(8):Cd003641.
27. Puzziferri N, Roshek TB, 3rd, Mayo HG, Gallagher R, Belle SH, Livingston EH. Long-term follow-up after bariatric surgery: a systematic review. *Jama*. 2014;312(9):934-42.
28. Courcoulas AP, Yanovski SZ, Bonds D, Eggerman TL, Horlick M, Staten MA, et al. Long-term outcomes of bariatric surgery: a National Institutes of Health symposium. *JAMA Surg*. 2014;149(12):1323-9.
29. Sjostrom L. Review of the key results from the Swedish Obese Subjects (SOS) trial - a prospective controlled intervention study of bariatric surgery. *J Intern Med*. 2013;273(3):219-34.
30. De Luca M, Angrisani L, Himpens J, Busetto L, Scopinaro N, Weiner R, et al. Indications for Surgery for Obesity and Weight-Related Diseases: Position Statements from the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO). *Obes Surg*. 2016;26(8):1659-96.
31. Angrisani L, Santonicola A, Iovino P, Formisano G, Buchwald H, Scopinaro N. Bariatric Surgery Worldwide 2013. *Obes Surg*. 2015;25(10):1822-32.
32. Medicare. Medicare item numbers 31569, 31572, 31575, processed from January 2015 to December 2015. Canberra; 2016.
33. Medicare. Medicare items 30511, 30512, 30518 processed from January 2005 to December 2005. Canberra; 2016.
34. Sjostrom L, Narbro K, Sjostrom CD, Karason K, Larsson B, Wedel H, et al. Effects of bariatric surgery on mortality in Swedish obese subjects. *N Engl J Med*. 2007;357(8):741-52.
35. Tice JA, Karliner L, Walsh J, Petersen AJ, Feldman MD. Gastric Banding or Bypass? A Systematic Review Comparing the Two Most Popular Bariatric Procedures. *The American Journal of Medicine*. 121(10):885-93.
36. Miras AD, le Roux CW. Mechanisms underlying weight loss after bariatric surgery. *Nat Rev Gastroenterol Hepatol*. 2013;10(10):575-84.
37. Hess DS, Hess DW. Biliopancreatic diversion with a duodenal switch. *Obes Surg*. 1998;8(3):267-82.
38. Biter LU, Gadiot RPM, Grotenhuis BA, Dunkelgrün M, van Mil SR, Zengerink HJJ, et al. The Sleeve Bypass Trial: a multicentre randomized controlled trial comparing the long

term outcome of laparoscopic sleeve gastrectomy and gastric bypass for morbid obesity in terms of excess BMI loss percentage and quality of life. *BMC obesity*. 2015;2:30.

39. Chang SH, Stoll CR, Song J, Varela JE, Eagon CJ, Colditz GA. The effectiveness and risks of bariatric surgery: an updated systematic review and meta-analysis, 2003-2012. *JAMA Surg*. 2014;149(3):275-87.
40. Zhang Y, Zhao H, Cao Z, Sun X, Zhang C, Cai W, et al. A randomized clinical trial of laparoscopic Roux-en-Y gastric bypass and sleeve gastrectomy for the treatment of morbid obesity in China: a 5-year outcome. *Obes Surg*. 2014;24(10):1617-24.
41. Fischer L, Wekerle A-L, Bruckner T, Wegener I, Diener MK, Frankenberg MV, et al. BariSurg trial: Sleeve gastrectomy versus Roux-en-Y gastric bypass in obese patients with BMI 35–60 kg/m² – a multi-centre randomized patient and observer blind non-inferiority trial. *BMC Surgery*. 2015;15:87.
42. National Heart Lung and Blood Institute. United States Department of Health and Human Services. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. Bethesda; 1998.
43. National Institute for Health and Care Excellence. Obesity: identification, assessment and management of overweight and obesity in children, young people and adults. London; 2014.
44. Borisenko O, Colpan Z, Dillemans B, Funch-Jensen P, Hedenbro J, Ahmed AR. Clinical Indications, Utilization, and Funding of Bariatric Surgery in Europe. *Obes Surg*. 2014.
45. Buchwald H, Estok R, Fahrbach K, Banel D, Jensen MD, Pories WJ, et al. Weight and type 2 diabetes after bariatric surgery: systematic review and meta-analysis. *Am J Med*. 2009;122(3):248-56 e5.
46. Yu J, Zhou X, Li L, Li S, Tan J, Li Y, et al. The long-term effects of bariatric surgery for type 2 diabetes: systematic review and meta-analysis of randomized and non-randomized evidence. *Obes Surg*. 2015;25(1):143-58.
47. Rubino F, Nathan DM, Eckel RH, Schauer PR, Alberti KGMM, Zimmet PZ, et al. Metabolic Surgery in the Treatment Algorithm for Type 2 Diabetes: A Joint Statement by International Diabetes Organizations. *Diabetes Care*. 2016;39(6):861-77.
48. Campbell JA, Venn A, Neil A, Hensher M, Sharman M, Palmer AJ. Diverse approaches to the health economic evaluation of bariatric surgery: a comprehensive systematic review. *Obes Rev*. 2016;17(9):850-94.
49. Inge TH, Courcoulas AP, Jenkins TM, Michalsky MP, Helmrath MA, Brandt ML, et al. Weight Loss and Health Status 3 Years after Bariatric Surgery in Adolescents. *N Engl J Med*. 2016;374(2):113-23.
50. Giordano S, Victorzon M. Bariatric surgery in elderly patients: a systematic review. *Clinical Interventions in Aging*. 2015;10:1627-35.
51. Hofmann B. Bariatric surgery for obese children and adolescents: a review of the moral challenges. *BMC Medical Ethics*. 2013;14(1):18.
52. Coles N, Birken C, Hamilton J. Emerging treatments for severe obesity in children and adolescents. *Bmj*. 2016;354:i4116.
53. Flum DR, Belle SH, King WC, Wahed AS, Berk P, Chapman W, et al. Perioperative safety in the longitudinal assessment of bariatric surgery. *N Engl J Med*. 2009;361(5):445-54.
54. Brethauer SA, Kothari S, Sudan R, Williams B, English WJ, Brengman M, et al. Systematic review on reoperative bariatric surgery: American Society for Metabolic and Bariatric Surgery Revision Task Force. *Surg Obes Relat Dis*. 2014;10(5):952-72.
55. Rodriguez-Carmona Y, Lopez-Alavez FJ, Gonzalez-Garay AG, Solis-Galicia C, Melendez G, Serralde-Zuniga AE. Bone mineral density after bariatric surgery. A systematic review. *International journal of surgery (London, England)*. 2014;12(9):976-82.

56. Mitchell JE, Crosby R, de Zwaan M, Engel S, Roerig J, Steffen K, et al. Possible Risk Factors for Increased Suicide Following Bariatric Surgery. *Obesity* (Silver Spring, Md). 2013;21(4):665-72.
57. King WC, Chen J, Mitchell JE, et al. Prevalence of alcohol use disorders before and after bariatric surgery. *JAMA*. 2012;307(23):2516-25.
58. Johansson K, Cnattingius S, Näslund I, Roos N, Trolle Lagerros Y, Granath F, et al. Outcomes of Pregnancy after Bariatric Surgery. *N Engl J Med*. 2015;372(9):814-24.
59. Livhits M, Mercado C, Yermilov I, Parikh JA, Dutson E, Mehran A, et al. Preoperative predictors of weight loss following bariatric surgery: systematic review. *Obes Surg*. 2012;22(1):70-89.
60. Chevallier JM, Paita M, Rodde-Dunet MH, Marty M, Nogues F, Slim K, et al. Predictive factors of outcome after gastric banding: a nationwide survey on the role of center activity and patients' behavior. *Ann Surg*. 2007;246(6):1034-9.
61. Libeton M, Dixon JB, Laurie C, O'Brien PE. Patient motivation for bariatric surgery: characteristics and impact on outcomes. *Obes Surg*. 2004;14(3):392-8.
62. Karmali S, Brar B, Shi X, Sharma AM, de Gara C, Birch DW. Weight recidivism post-bariatric surgery: a systematic review. *Obes Surg*. 2013;23(11):1922-33.
63. Fried M, Yumuk V, Oppert JM, Scopinaro N, Torres AJ, Weiner R, et al. Interdisciplinary European Guidelines on metabolic and bariatric surgery. *Obes Facts*. 2013;6(5):449-68.
64. Nielsen JB, Pedersen AM, Gribsholt SB, Svensson E, Richelsen B. Prevalence, severity, and predictors of symptoms of dumping and hypoglycemia after Roux-en-Y gastric bypass. *Surg Obes Relat Dis*. 2016.
65. Richardson WS, Plaisance AM, Periou L, Buquoi J, Tillery D. Long-term Management of Patients After Weight Loss Surgery. *The Ochsner Journal*. 2009;9(3):154-9.
66. Monkhouse SJW, Morgan JDT, Norton SA. Complications of Bariatric Surgery: Presentation and Emergency Management – a Review. *Ann R Coll Surg Engl*. 2009;91(4):280-6.
67. National Confidential Enquiry into Patient Outcome and Death. Too Lean a Service? A review of the care of patients who underwent bariatric surgery. London; 2012.
68. Santry HP, Chin MH, Cagney KA, Alverdy JC, Lauderdale DS. The use of multidisciplinary teams to evaluate bariatric surgery patients: results from a national survey in the U.S.A. *Obes Surg*. 2006;16(1):59-66.
69. International federation for the surgery of obesity and metabolic disorders. First IFSO global registry report. Henley-on-Thames; 2014.
70. Bhogal SK, Reddigan JI, Rotstein OD, Cohen A, Glockler D, Tricco AC, et al. Inequity to the utilization of bariatric surgery: a systematic review and meta-analysis. *Obes Surg*. 2015;25(5):888-99.
71. Australian Institute of Health and Welfare. Weight loss surgery in Australia. Cat. no. HSE 91. Canberra; 2010.
72. Alfa Wali M, Ashrafian H, Schofield KL, Harling L, Alkandari A, Darzi A, et al. Is social deprivation associated with weight loss outcomes following bariatric surgery? A 10-year single institutional experience. *Obes Surg*. 2014;24(12):2126-32.
73. Lukas N, Franklin J, Lee CM, Taylor CJ, Martin DJ, Kormas N, et al. The efficacy of bariatric surgery performed in the public sector for obese patients with comorbid conditions. *Med J Aust*. 2014;201(4):218-22.
74. Burton P, Brown W, Chen R, Shaw K, Packiyathan A, Bringmann I, et al. Outcomes of high-volume bariatric surgery in the public system. *ANZ J Surg*. 2016;86(7-8):572-7.

75. Christou NV, Efthimiou E. Bariatric surgery waiting times in Canada. *Canadian Journal of Surgery*. 2009;52(3):229-34.
76. Government of Tasmania - Department of Health and Human Services. Final report from the bariatric surgery careway advisory group. Hobart; 2010.
77. Government of Western Australia - Department of Health. WA health bariatric surgery plan - a standardised approach to surgery for obesity. Perth; 2012.
78. Klarenbach S, Padwal RS, Wiebe N, Hazel M, Birch D, Manns B, et al. Bariatric surgery for severe obesity: a systematic review and economic evaluation. Ottawa: Canadian Agency for Drugs and Technologies in Health, Health CAfDaTi; 2010.
79. Fung M, Wharton S, Macpherson A, Kuk JL. Receptivity to Bariatric Surgery in Qualified Patients. *J Obes*. 2016;2016:5372190.
80. Australian Bureau of Statistics. *Australian Health Survey 2011-2013*, Expanded CURF, RADL. Findings based on use of ABS CURF data. Canberra; 2012.
81. Medicare. Medicare items 30511, 30512, 30518 processed from July 2003 to June 2013. Canberra; 2016.

Chapter 2: Methods

To fulfil the objectives of this PhD project, data were collected from several sources:

1. The 2011-2013 Australian Health Survey (AHS) was the largest (n= 31,837) and most comprehensive health survey ever conducted in Australia (1). It collected sociodemographic (e.g. sex, age, geographical location), physical (e.g. measured height, weight, blood pressure, self-rated health, health conditions, smoking status) and clinical information (e.g. measured biomedical markers of chronic disease). Data from the AHS were used to estimate the number and characteristics of those potentially eligible for bariatric surgery in Australia. A comprehensive description of the methodology used can be found in Chapter 3.
2. To determine the level of guidance provided on publicly-funded bariatric surgery in Australia, the relevant documents were requested from health service planners in each Australian state and territory. These guidelines were then compared with national level guidelines from Australia, UK and US available through the internet. A comprehensive description of the methodology can be found in Chapter 4.
3. Focus groups were used to enhance understanding of the reasons why people seek bariatric surgery and the support experiences and needs of those who had undergone bariatric surgery. Both focus groups and individual interviews were used to explore the experience of waiting for publicly-funded bariatric surgery. A comprehensive description of the methodologies can be found in Chapters 5-6 (focus groups) and Chapter 7 (focus groups and individual interviews).

1. Australian Bureau of Statistics. *Australian Health Survey 2011-2013*, Expanded CURF, RADL. Findings based on use of ABS CURF data. Canberra 2012.

Chapter 3: Population estimates and characteristics of Australians potentially eligible for bariatric surgery: Findings from the 2011-13 Australian Health Survey

Sharman MJ, Breslin MC, Kuzminov A, Palmer AJ, Blizzard L, Hensher M, Venn AJ.

This paper was published in Australian Health Review, 2017 (epub ahead of print).

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Manuscript context

The potential demand for bariatric surgery in Australia and the characteristics of those potentially eligible for this service was unknown. This manuscript sought to fill this knowledge gap needed to optimise health service planning.

Abstract

Objective: To determine the potential demand for publicly- and privately-funded bariatric surgery in Australia. *Methods:* Nationally representative data from the 2011-13 Australian Health Survey were used to estimate the numbers and characteristics of Australians meeting specific eligibility criteria. *Results:* Of the 3,352,037 adult Australians (18-65 years) estimated to be living with obesity in 2011-13, 882,441 (26.3%; 95% confidence intervals (CI) 23.0, 29.6) were potentially eligible for bariatric surgery; (6.2%; CI 5.4, 7.1 of the adult population aged 18-65 (n=14,122,020)). Of these 396,856 (45.0%; CI 40.4, 49.5) had class 3 obesity; 470,945 (53.4%; CI 49.0, 57.7) had class 2 obesity with obesity-related comorbidity; 14,640 (1.7%; CI 0.6, 2.7) had class 1 obesity with poorly-controlled type 2 diabetes and increased cardiovascular risk; 458,869 (52.0%; CI 46.4, 57.6) were female; 404,594 (45.8%; CI 37.3, 54.4) had no private health insurance; and 309,983 (35.1%; CI 28.8, 41.4) resided outside a major city. *Conclusion:* Even if only 5% of Australian adults estimated to be eligible for bariatric surgery sought this intervention, the demand, particularly in the public health system and outside major cities, would far outstrip current capacity. Better guidance on patient prioritisation and greater resourcing of public surgery are needed.

What is known about this topic?

In the period 2011-13, 4 million Australian adults were estimated to be living with obesity, with obesity disproportionately more prevalent in areas of socio-economic disadvantage (1). Bariatric surgery is considered to be cost effective and the most effective treatment for adults with obesity, but is mainly privately-funded in Australia (>90%) with 16, 650 primary privately-funded procedures performed in 2015 (2-5). By how much the supply of bariatric surgery is falling short of demand in Australia is unknown.

What does this paper add?

This study has provided important information for health service planners. For the first time, population estimates and characteristics of those potentially eligible for bariatric surgery in Australia have been described based on the best available evidence, using categories that best approximate the national recommended eligibility criteria (5).

What are the implications for practitioners?

Even if only 5% of those estimated to be potentially eligible for bariatric surgery in Australia sought a surgical pathway (44, 122 from 882,441), the potential demand, particularly in the public health system and outside major cities, would still far outstrip current capacity, underscoring the immediate need for better guidance on patient prioritisation. Our findings provide a strong signal that more funding of public surgery and other effective interventions to assist this population group are necessary.

Introduction

Bariatric surgery is more effective than conservative interventions to treat resistant obesity and is considered cost-effective (4-6). Generally it is recommended for those with resistant class 3 obesity (body mass index (BMI) ≥ 40 kg/m²) or resistant class 2 obesity (BMI 35-39.9 kg/m²) and obesity-related comorbidity (5, 7, 8). In recent national guidelines for obesity management (5, 8) bariatric surgery has also been recommended to be considered for those with resistant class 1 obesity (BMI ≥ 30 -34.9 kg/m²) and type-2 diabetes mellitus (T2DM). This is because of accumulating evidence that metabolic health improves post-surgery (6, 9).

As in many other countries, significant numbers of Australians live with overweight or obesity (10). Four million adult Australians or 27.2% of the adult population were estimated to be living with obesity in 2011-12, up from 19.1% in 1995(1). Although obesity is more

prevalent in areas of socio-economic disadvantage (1) and surgical outcomes appear comparable by funding type (11-13), >90% of bariatric surgery in Australia is privately-funded (16,650 primary privately-funded procedures were performed in 2015 (2, 3) - a funding pattern that appears similar to elsewhere e.g. Mexico and United Arab Emirates (14). Not all Australian jurisdictions provide publicly-funded bariatric surgery and where it is available the waiting period can be prolonged (15-17). Of additional concern is that the wait for bariatric surgery may be associated with declining health (18). The extent to which supply is falling short of potential demand in Australia and in many countries, is unknown (19). In one Canadian study, 23% of patients in a publicly-funded weight management program and who were deemed eligible for bariatric surgery expressed interest in pursuing a surgical pathway (20). Many individual, social and environmental factors (e.g. a patient's health status, recommendations made by health professionals, exposure to other recipients of bariatric surgery) can influence a preference for surgery (21).

The objectives of this study were to use national population survey data (2011-13 Australian Health Survey (AHS) (22)) to: 1) estimate the number of Australians potentially eligible for bariatric surgery; 2) describe their demographic characteristics, health status and health service use and; 3) estimate the potential demand for surgery in the public and private health systems.

Methods

Data were extracted from the cross-sectional 2011-13 AHS conducted by the Australian Bureau of Statistics (n = 31,837) (22). The survey used a stratified multistage area sample of private dwellings to ensure a nationally representative sample. The AHS comprised two main surveys: The National Health Survey (NHS) and the National Nutrition and Physical Activity

Survey (NNPAS). Participants completed only one survey. Common to both surveys was a core component that included questions and measures of socio-demographic characteristics (e.g. sex, age, geographical location) and physical and health characteristics (e.g. measured height, weight, blood pressure, self-rated health, health conditions, smoking status).

Participants from either the NHS or NNPAS were invited to complete the National Health Measures Survey (NHMS). The NHMS collected blood and urine samples and tested for chronic disease biomarkers including fasting plasma glucose, blood lipids, albumin, creatinine and alanine aminotransferase (ALT). Our sample was drawn from the NHMS. We also conducted a sub-analysis using a sample that had completed both the NHMS and NHS, enabling analysis of private health insurance status and health service use (22). Only those with complete measured height and weight data were included in our analyses. The structure, response rates and sample sizes of the AHS are summarised in Figure 1. Further details on the AHS can be found in the user's guide (23).

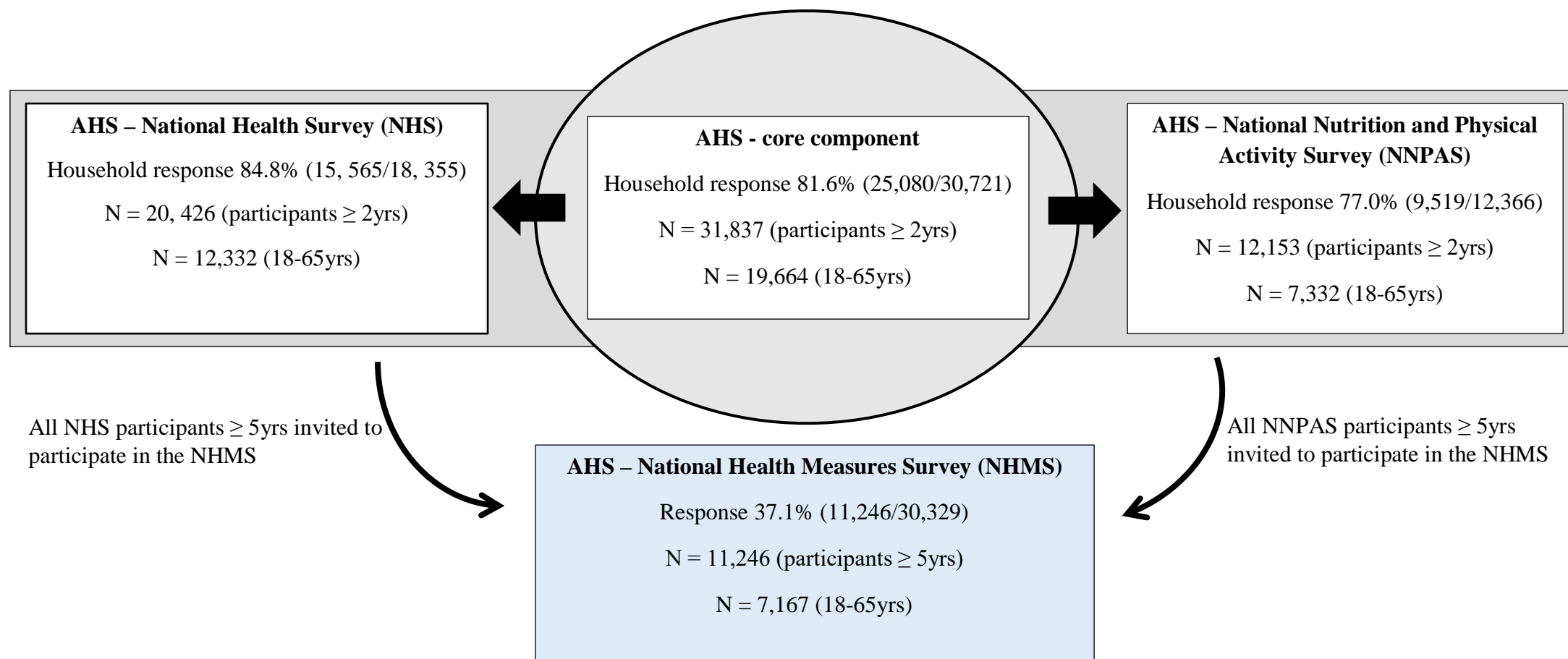


Figure 1: Design of and response rates for the 2011-13 Australian Health Survey (AHS). AHS participants completed the NHS or the NNPAS. The AHS core component was common to both surveys. Response proportions represent adequately or fully responding households except for the NHMS where the response proportion reflects the total number of participants relative to total number of participants in the core component of the AHS. Our sample was drawn from the NHMS. Adapted from the AHS users' guide (19).

Eligibility for surgery

Participants were classified as potentially eligible for bariatric surgery based on survey data that best approximated the 2013 Australian criteria for considering bariatric surgery (5) i.e. for adults (18–65 years) with resistant class 3 obesity ($\text{BMI} \geq 40 \text{ kg/m}^2$); or class 2 obesity ($\text{BMI} 35\text{--}39.9 \text{ kg/m}^2$) with at least one obesity-related comorbidity (at risk of a cardiovascular (CV) event/mortality or experiencing hypertension, T2DM, chronic kidney disease, non-alcoholic steatohepatitis (NASH) or gastro-oesophageal reflux disease (GORD)); or class 1 obesity with poorly controlled T2DM and increased CV risk. A summary of the variables and classification criteria can be found in Table 1. Our classifications were limited by the data available within the AHS and did not cover the range of factors considered when making a clinical judgement about eligibility for surgery (e.g. classifying resistant obesity, patient preference). Consequently, we make reference to potential eligibility only. Bariatric surgery may be recommended for those outside of the 18-65 years age range (12, 24), but our analysis was based on Australian guidelines only (5).

Table 1: Description of variables used to determine potential eligibility for bariatric surgery

Variable	Method* and description	Cut-points used in this paper	Limitations
<i>Age (years)</i>	Self-reported	18-65	n/a
<i>Body mass index (kg/m²)</i>	Height measured with stadiometer in cm to 1 decimal point and repeated in 10% of randomly selected participants and again if heights differed >1cm. Weight measured once using digital scales recorded to nearest 100g.	Class 1 obesity 30-34.99 Class 2 obesity 35-39.99 Class 3 obesity ≥ 40	Maximum weight limit of digital scales 150kg. No individuals in our sample weighing 150kg were tall enough to be misclassified with class 2 instead of class 3 obesity. Total with missing height or weight data excluded from our sample n=363.
Class 1 obesity only (must have poorly controlled T2DM and increased CV risk to be potentially eligible for bariatric surgery)			
<i>Poorly controlled T2DM</i>	Included known diabetes defined as self-reported doctor or nurse diagnosed diabetes (type 2 or type unknown) and measured HbA1c ≥ 6.5 mmol/mol, or medicated for diabetes and measured HbA1c ≥ 6.5 mmol/mol. Gestational diabetes excluded.	HbA1c ≥ 6.5 mmol/mol	Diabetes was self-reported – may be prone to error. Poorly controlled T2DM classified on basis of single high HbA1c but clinically more results would be required. Diabetes type unknown classified as T2DM because unlikely T1DM status would be unknown.
<i>Increased CV risk</i>	CV risk score $\geq 15\%$ calculated as per Australian guidelines (25) using Framingham risk equation. Algorithm included age, diabetes (any type), HDL cholesterol, sex, smoking status (current), systolic BP, total cholesterol (26). Participants with self-reported current and long-term angina, other ischaemic heart diseases, heart failure, other heart diseases, stroke, other cerebrovascular diseases also included. Self-reported heart attack and oedema combined with heart failure were only available in NHS and were included in health insurance status sub-analysis.	5 year CV risk $\geq 15\%$	Limitations of diabetes and BP measures described elsewhere. No data for quit smoking in last year as used in Framingham risk equation. CV risk score affected by medications which were not reported in core component of AHS. Possible self-report errors.

Class 2 obesity only (must have one of the following obesity-related comorbidities to be potentially eligible for bariatric surgery)			
At risk of a CV event/mortality	Defined as per 'Increased CV risk' above.	5 year CV risk \geq 15%	See 'Increased CV risk'
Chronic kidney disease	Included participants with stage 1 through 5 chronic kidney disease (identified by combining measured eGFR with ACR) and those with self-reported current and long-term chronic kidney disease.	<i>Stage 1 through 5</i> eGFR \geq 90 mL/min/1.73 m ² & albuminuria to eGFR < 30 mL/min/1.73 m ²	Chronic kidney disease classified on basis of single eGFR and ACR result – clinically, more results would be required. Possible self-report errors.
Hypertension (mmHg)	Automated BP machine used with 3 cuff sizes. Preferred position seated, extended relaxed left arm, forearm supinated. Generally, two measures, second measure recorded in AHS output. Another reading taken if first and second readings differed by \geq 10 mmHg. Average of second and third reading then used unless difference \geq 20mmHg. Invalid result recorded if all readings differed by \geq 20mmHg. Participants with self-reported current and long-term high blood pressure also included.	\geq 140 systolic BP or \geq 90 diastolic BP	Hypertension classified on basis of single elevated blood pressure reading- clinically more results would be required. Possible self-report errors.
Non-alcoholic steatohepatitis (NASH)	Measured abnormal ALT used as a surrogate indicator of NASH.	ALT >30U/L females and >40U/L for males.	NASH classified on basis of ALT results- clinically more results would be required.
T2DM	Included: known diabetes defined as self-reported doctor or nurse diagnosed diabetes (type 2 or type unknown) or medicated for diabetes; and newly diagnosed diabetes (type undetermined) defined as HbA1c \geq 6.5 mmol/mol and diabetes not previously diagnosed by doctor or nurse and no diabetes medication taken. Gestational diabetes excluded.	HbA1c \geq 6.5 mmol/mol	Possible self- report errors. Newly diagnosed diabetes classified as T2DM because unlikely participant first diagnosed with T1DM through AHS and > half of new T1DM cases diagnosed at <18yrs (27). Newly diagnosed T2DM classified on basis of single high HbA1c but clinically more results would be required.

* Blood samples taken at pathology centres or at home using standard protocols and analysed at a central laboratory using accredited equipment. Key: ALT alanine aminotransferase; ACR albumin creatinine ratio; AHS Australian Health Survey; BP blood pressure; CV cardiovascular; eGFR estimated glomerular filtration rate; HbA1c haemoglobin A1c; HDL high density lipoprotein; NHS National Health Survey; T1DM type 1 diabetes mellitus; T2DM type 2 diabetes mellitus

Other variables included in the analysis were: *index of relative socio-economic disadvantage* that ranks geographical areas of residence according to their social and economic status; *remoteness area category* based on the location of a participant's residence classified as major city, inner regional or outer regional; *private health insurance status* reported by participants; *self-rated health* reported by participants as excellent, very good, good, fair or poor; and *health service use* reported by participants including consultation with a general practitioner or specialist, having been admitted to hospital as an inpatient, or visits to an emergency department or as an outpatient during the last two weeks. Health service use and private health insurance status data were extracted from the NHS, while data for the remaining variables were extracted from the core component of the AHS (Figure 1).

Statistical analysis

Summary data are presented as means of continuous variables and percentages of categorical variables. A weighted Poisson regression model was used to estimate associations with factors influencing health service use including age, sex, socioeconomic status, remoteness area category and private health insurance. In all analyses, estimates were weighted with sampling weights provided by the Australian Bureau of Statistics, and 95% confidence intervals (CI) derived using replicate weights within the svr program (23).

Results

Population estimates were calculated based on a sample of 6,804 adults (18-65yrs) with complete height and weight data who had completed the NHMS. Of the 3,352,037 Australians aged 18-65 years estimated to be living with obesity 882,441 (26.3%) were estimated to be potentially eligible for bariatric surgery. This was comprised mostly of those with class 2 or 3 obesity (Table 2).

Table 2: Population estimates of adult Australians aged 18-65 years potentially eligible for bariatric surgery by obesity class. Findings from the 2011-13 Australian Health Survey

	Total Australian population aged 18-65 years estimated to be potentially eligible for bariatric surgery	% of Australian population aged 18-65 years (sample n=6,804) Population estimate N=14,122,020	% of Australian population living with obesity aged 18-65 years (sample n=1,938) Population estimate N=3,352,037	% of total estimated to be potentially eligible for bariatric surgery
Eligible - all obesity classes				
(sample n=540)	882,441	6.2 (5.4, 7.1)	26.3 (23.0, 29.6)	100.0
Eligible - Class 1				
(sample n=17)	14,640	0.1 (0.0, 0.2)	0.4 (0.2, 0.7)	1.7 (0.6, 2.7)
Eligible - Class 2				
(sample n=286)	470,945	3.3 (2.8, 3.8)	14.0 (12.1, 16.0)	53.4 (49.0, 57.7)
Eligible - Class 3				
(sample n=237)	396,856	2.8 (2.3, 3.3)	11.8 (9.8, 13.9)	45.0 (40.4, 49.5)

Eligibility criteria for bariatric surgery as per NHMRC guidelines (5). All estimates for adults 18-65 years. 95% confidence intervals in parentheses. Weights used for population estimates determined by the Australian Bureau of Statistics at time of survey 2011-13 (22). The sample number refers to the size of the sample from which the estimates were made. Refer to Figure 1 for the design of the AHS.

There was variation between the states and territories: Queensland had the highest percentage of the population potentially eligible for bariatric surgery (7.5%) and Western Australia the lowest (5.1%) (Table 3).

Table 3: Population estimates of adult Australians aged 18-65 years potentially eligible for bariatric surgery for each Australian jurisdiction. Findings from the 2011-13 Australian Health Survey

Australian state/territory	Total potentially eligible for bariatric surgery	Total population aged 18-65 years for each state/territory	% of total state/territory population aged 18-65 years potentially eligible for bariatric surgery	population aged 18-65 years living with obesity per state/territory	% of population aged 18-65 years living with obesity in each state/territory potentially eligible for bariatric surgery
Australian Capital Territory	18,568 (sample n=731)	250,252	7.4 (5.3, 9.5)	57,281 (sample n=193)	32.4 (25.5, 39.3)
New South Wales	280,524 (sample n=1,148)	4,557,663	6.2 (4.5, 7.8)	1,081,415 (sample n=309)	25.9 (19.5, 32.4)
Northern Territory	8,158 (sample n=526)	113,990	7.2 (4.7, 9.6)	25,625 (sample n=103)	31.8 (20.7, 43.0)
Queensland	210,753 (sample n=1,216)	2,823,636	7.5 (5.8, 9.1)	728,965 (sample n=341)	28.9 (23.7, 34.1)
South Australia	63,645 (sample n=889)	1,008,229	6.3 (4.7, 7.9)	265,642 (sample n=272)	24.0 (18.5, 29.4)
Tasmania	22,325 (sample n=806)	314,293	7.1 (5.0, 9.2)	83,332 (sample n=226)	26.8 (20.5, 33.1)
Victoria	203,345 (sample n=963)	3,575,516	5.7 (3.9, 7.4)	725,697 (sample n=234)	28.0 (20.4, 35.6)
Western Australia	75,123 (sample n=988)	1,478,441	5.1 (3.6, 6.6)	384,081 (sample n=260)	19.6 (13.8, 25.3)

Eligibility criteria for bariatric surgery as per NHMRC guidelines (5). All estimates for adults 18-65 years. 95% confidence intervals in parentheses. The sample number refers to the size of the sample from which the estimates were made.

The characteristics of those potentially eligible for bariatric surgery compared with those classified as ineligible for surgery are described in Table 4, except for those potentially eligible with class 1 obesity because of the small sample size (n=17). Slightly more females were potentially eligible for surgery due to their higher prevalence of class 3 obesity. Compared with the ineligible population living with obesity, the potentially eligible population were more likely to be female, reside outside of a major city, be of low socioeconomic position, and rate their health as 'poor'. As a consequence of the selection criteria being dependent on comorbidity, those with class 2 obesity potentially eligible for surgery on average had poorer obesity-related health and were older (by 4.9 years), than those with class 3 obesity. Hypertension was the most common reason an individual with class 2 obesity became potentially eligible.

Potential eligibility for bariatric surgery was associated with more health service use independent of age, sex, remoteness area category, private health insurance and socioeconomic status (Table 5). As expected (due to the selection criteria) being potentially eligible for surgery with class 2 obesity was associated with more medical appointments in the previous two weeks.

Table 4: The characteristics of adult Australians aged 18-65 years potentially eligible for bariatric surgery. Findings from the 2011/2013 Australian Health Survey

Characteristic*	Potentially eligible for bariatric surgery			Ineligible for bariatric surgery	
	Class 2 (sample n=286) Population estimate N=470,945	Class 3 (sample n=237) Population estimate N=396,856	Total (sample n=540) Population estimate N=882,441	All weight classes (sample n=6,264) Population estimate N=13,239,579	Obesity only weight classes (sample n=1,398) Population estimate N=2,469,595
<i>BMI (kg/m²)</i>	37.1 (36.8, 37.4)	43.9 (43.3, 44.5)	40.1 (39.6, 40.6)	26.1 (25.9, 26.2)	32.8 (32.6, 32.9)
<i>Age (years)</i>	47.8 (45.6, 50.1)	42.9 (40.3, 45.6)	45.8 (44.2, 47.5)	39.7 (39.6, 39.9)	44.0 (43.0, 45.1)
<i>Female sex (%)</i>	42.1 (34.6, 49.5)	65.4 (56.5, 74.2)	52.0 (46.4, 57.6)	49.1 (48.7, 49.5)	45.6 (42.2, 49.0)
<i>Remoteness area category</i>					
Major city (%)	67.8 (60.1, 75.4)	61.4 (52.4, 70.4)	64.9 (58.6, 71.2)	74.5 (73.0, 76.1)	70.3 (66.9, 73.8)
Inner regional (%)	22.0 (14.7, 29.3)	26.8 (18.0, 35.5)	23.9 (18.4, 29.4)	18.0 (16.0, 20.0)	21.9 (18.5, 25.2)
Outer regional (%)	10.2 (6.5, 13.9)	11.8 (5.9, 17.8)	11.2 (7.7, 14.7)	7.4 (5.9, 9.0)	7.8 (6.1, 9.4)
<i>Index of relative socio-economic disadvantage</i>					
1 (%) (most disadvantaged)	21.6 (15.1, 28.1)	26.5 (17.0, 35.9)	23.6 (17.6, 29.6)	15.6 (13.9, 17.3)	20.5 (17.5, 23.5)
2 (%)	28.9 (21.1, 36.7)	29.6 (20.5, 38.7)	29.1 (22.8, 35.5)	18.9 (16.6, 21.2)	23.2 (19.3, 27.1)
3 (%)	18.5 (12.7, 24.4)	17.2 (10.3, 24.2)	18.0 (14.0, 22.0)	20.7 (18.2, 23.3)	17.7 (14.6, 20.8)
4 (%)	15.3 (9.3, 21.3)	11.1 (5.6, 16.7)	13.7 (9.3, 18.2)	21.5 (18.5, 24.5)	19.5 (15.9, 23.2)
5 (%) (least disadvantaged)	15.6 (6.6, 24.7)	15.5 (7.8, 23.3)	15.6 (8.9, 22.3)	23.3 (20.9, 25.7)	19.0 (15.6, 22.4)

<i>Diabetes</i>						
FPG (mmol/L) (%)	10.5 (6.1, 14.9)	8.5 (4.2, 12.8)	10.7 (7.5, 14.0)	1.0 (0.7, 1.4)	2.0 (1.3, 2.8)	
(known diabetes)						
FPG (mmol/L) (%)	3.6 (0.7, 6.5)	6.4 (0.0, 12.7)	4.8 (1.6, 8.1)	0.3 (0.1, 0.4)	1.0 (0.3, 1.7)	
(newly diagnosed †)						
HbA1c (mmol/mol) (%)	14.0 (9.4, 18.6)	11.0 (5.1, 16.9)	14.1 (10.1, 18.1)	1.3 (0.9, 1.6)	2.5 (1.7, 3.3)	
(known diabetes)						
HbA1c (mmol/mol) (%)	5.4 (1.4, 9.4)	7.4 (1.0, 13.8)	6.2 (2.7, 9.7)	0.5 (0.3, 0.7)	1.1 (0.4, 1.8)	
(newly diagnosed †)						
<i>High blood pressure ‡ (mmHg) (%)</i>	62.5 (52.1, 72.9)	49.2 (39.7, 58.6)	56.7 (49.4, 64.0)	16.5 (15.4, 17.6)	28.6 (25.0, 32.1)	
<i>CVD – self report (%)</i>	7.5 (4.0, 11.1)	4.9 (1.7, 8.1)	6.6 (4.3, 8.9)	2.1 (1.7, 2.5)	3.5 (2.2, 4.7)	
<i>CVD risk ≥ 15% (%)</i>	7.6 (4.3, 10.9)	5.8 (0.0, 12.1)	7.9 (4.5, 11.4)	1.0 (0.8, 1.3)	1.5 (0.9, 2.2)	
<i>Chronic kidney disease (stages 1-5) (%)</i>	13.7 (8.8, 18.7)	16.4 (8.4, 24.4)	15.4 (11.1, 19.7)	5.7 (4.9, 6.5)	4.6 (3.3, 5.9)	
<i>Abnormal liver function (ALT >30U/L females >40U/L males) (%)</i>	46.6 (38.1, 55.1)	21.8 (14.0, 29.5)	34.8 (29.1, 40.5)	10.4 (9.3, 11.6)	17.4 (14.9, 19.9)	
<i>Self-rated health (%)</i>						
Excellent	8.0 (2.6, 13.3)	3.7 (0.7, 6.6)	5.9 (2.9, 8.9)	21.1 (19.5, 22.7)	11.3 (8.8, 13.8)	
Very good	22.6 (14.8, 30.4)	22.1 (15.5, 28.7)	22.0 (16.9, 27.1)	40.2 (38.0, 42.4)	34.1 (30.3, 37.9)	
Good	44.9 (35.2, 54.5)	36.2 (27.2, 45.2)	40.8 (34.7, 46.9)	29.1 (27.1, 31.0)	38.7 (35.3, 42.2)	
Fair	17.0 (10.8, 23.1)	30.1 (21.2, 39.0)	23.3 (17.5, 29.1)	7.5 (6.6, 8.4)	12.9 (10.5, 15.2)	
Poor	7.6 (2.2, 13.0)	7.9 (3.4, 12.4)	8.0 (4.5, 11.5)	2.1 (1.6, 2.7)	3.0 (2.0, 4.1)	

Eligibility criteria for bariatric surgery as per NHMRC guidelines (5). *All estimates for adults 18-65 years are means unless otherwise stated. 95% confidence intervals in parentheses. Individuals with missing height or weight data not included. The sample number refers to the size of the sample from which the estimates were made. Population estimates for class 1 obesity were not reported because of low sample size. †Diabetes not known before AHS. ‡ High blood pressure defined as systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg Key: ALT alanine aminotransferase; CVD cardiovascular disease; FPG fasting plasma glucose; HbA1c haemoglobin A1c

Table 5: Risk and relative risk of using health services in the previous two-week period for adult Australians aged 18-65 years by obesity category and potential eligibility for bariatric surgery. Findings from the 2011-13 Australian Health Survey

Health service use										
	Medical appointment					Hospital visit				
	%	n/N	Unadjusted	Model 1*	Model 2†	%	n/N	Unadjusted	Model 1*	Model 2†
			RR	Adjusted RR	Adjusted RR			RR	Adjusted RR	Adjusted RR
			(95% CI)	(95% CI)	(95% CI)			(95% CI)	(95% CI)	(95% CI)
			(sample n=8,694)	(sample n=8,694)	(sample n=8,668)			(sample n=8,694)	(sample n=8,694)	(sample n=8,668)
Eligibility status										
All ineligible	22.4	1,832/8,1972	Ref	Ref	Ref	1.3	104/8,093	Ref	Ref	Ref
All eligible	35.4	264/745	1.56 (1.36, 1.79)	1.43 (1.24, 1.65)	1.43 (1.24, 1.65)	2.6	19/745	2.21 (1.16, 4.23)	2.29 (1.15, 4.56)	2.20 (1.12, 4.31)
Eligible - class 1 obesity	35.7	5/14	1.97 (0.45, 8.53)	1.77 (0.41, 7.63)	1.71 (0.40, 7.28)	0.0	0/14	0.00 (0.00, 2.00)	0.00 (0.00, 0.13)	0.00 (0.00, 0.00)
Eligible - class 2 obesity	37.9	139/367	1.76 (1.47, 2.12)	1.61 (1.32, 1.97)	1.63 (1.34, 1.99)	2.5	9/367	1.74 (0.77, 3.92)	1.87 (0.78, 4.44)	1.82 (0.76, 4.32)
Eligible - class 3 obesity	33.0	120/364	1.33 (1.12, 1.59)	1.23 (1.04, 1.47)	1.22 (1.03, 1.45)	2.8	10/364	2.80 (1.23, 6.35)	2.76 (1.21, 6.28)	2.61 (1.16, 5.88)

The outcome 'Medical Appointment' is whether a participant had an appointment in the last two weeks with a general practitioner or specialist or at a hospital outpatient facility or day clinic. 'Hospital visit' is whether a participant visited hospital as an inpatient or attended an emergency facility. *Model 1 adjusted for age and sex †Model 2 also adjusted for remoteness area category and socioeconomic and private health insurance status. The sample number refers to the size of the sample from which the estimates were made. Key: RR relative risk

Of the total 882,441 Australians estimated to be potentially eligible for bariatric surgery 45.8% (405,594) were without private health insurance (sample n=165), of whom 54.5% (CI 42.5, 66.6) were female. More of those potentially eligible for surgery (78.5%; CI 69.5, 87.4) reported that private health insurance was unaffordable than did the ineligible population living with obesity (67.3%; CI 60.0, 74.5). Overall, the proportions of females and males potentially eligible for bariatric surgery with private health insurance were similar (48.9% female; CI 38.6, 59.1). However, there were differences between the sexes within the class 2 and 3 obesity categories, where the proportion of females with insurance was 39.3% (CI 25.4, 53.2) and 67.3% (CI 54.5, 80.0) respectively. Of those potentially eligible for bariatric surgery with private health insurance (sample n=192), 36.7% (CI 25.4, 47.9) were of low socioeconomic position (\leq Quintile 2 – the most disadvantaged).

Sensitivity analysis

We assessed how sensitive our prevalence estimates were to possible misclassification of comorbidities for those with class 2 obesity (see Table 1 for comorbidity definitions and their limitations). We considered our definition of NASH (elevated ALT) to be the most error prone and removing this comorbidity reduced the total number estimated to be potentially eligible for surgery by 107,023 to 775,418. The numbers of individuals who became potentially eligible for bariatric surgery based solely on other specific criteria were as follows: risk of a CV event/mortality n=4,274; existing chronic kidney disease n=18,550; existing hypertension n=125,472; and existing T2DM n=16,247. A more conservative HbA1c cut-point of ≥ 7.0 mmol/mol to indicate the presence of diabetes, instead of a cut-point of ≥ 6.5 mmol/mol (as used in the AHS), reduced the population estimate by 5,791.

Discussion

Our findings provide compelling evidence that the potential need for bariatric surgery in Australia far outweighs availability, especially through the public health system – a situation also seen elsewhere (e.g. Canada (28, 29)). Even if only 5% of those estimated to be potentially eligible for bariatric surgery sought this pathway (44,122 of 882,441), demand would still exceed current capacity. Further, we found that approximately half of those Australian adults potentially eligible for bariatric surgery would likely need to access this service through the public health system if they chose to seek this intervention. This finding highlights the immediate need for guidelines on the prioritisation of eligible patients for publicly-funded bariatric surgery. Additionally, the total estimated to be potentially eligible for surgery provides a strong signal that more funding of public surgery and other effective interventions to assist this population group are necessary. Given the limitations in the supply of publicly-funded bariatric surgery in Australia, health economic modelling is needed to determine prioritisation for the allocation of this limited resource.

Currently, there is inequitable access to bariatric surgery in Australia favouring those who can access this service through the private health system (2, 30). Further, recipients of bariatric surgery in Australia are more likely to be aged between 35-54 years, of middle socioeconomic status, living in a major city and female (2). These characteristics are similar to those collectively identified in a recent systematic review of 12 retrospective cohort studies conducted in the US, UK, Canada and Australia (19). This same review reported that the average proportion of those eligible who received bariatric surgery ranged between 1 and 5% (19). During the period July 2011 to June 2012, 11,586 privately-funded bariatric surgeries (excluding revisions and reversals) were performed in Australia (31). According to our results this represented 1.3% of the population potentially eligible for surgery. Australian-based modelling estimated that increasing the provision of bariatric surgery in Australia

through public funds by 30% per year over the ten year period 2015-2025, had the potential to reduce the number of people with obesity by 4,400, resulting in a societal saving of \$170 million (32).

Our finding that significantly more females had class 3 obesity (a pattern seen in other countries, e.g. Canada and the US (33)) and that females were more likely to have private health insurance within the same obesity class, may partly explain why more females are having bariatric surgery (2, 14, 31). However, more research is needed to understand sex differences in the uptake of surgery (14).

We found that 36.7% (175,356/477,847) of those potentially eligible for surgery with private health insurance were of low socioeconomic position (\leq quintile 2). This has potential implications for the public health system because of the relatively common need for re-operative bariatric surgery. A recent systematic review demonstrated that on average 2.5-18.4% of bariatric surgery recipients required a reoperation and 13-25.2% required a subsequent reoperation (34). Patients should be encouraged to maintain their health insurance which may be more challenging for those experiencing socio-economic disadvantage.

Ensuring equitable access to publicly-funded bariatric surgery and determining the optimal number of surgeries to perform and who should get priority is difficult. Health economic modelling is needed to determine who should be prioritised for this limited resource - a process that will be aided by the recently initiated Australian bariatric surgery registry. This registry will fill important knowledge gaps needed to inform an improved prioritisation system if sufficient numbers of surgeons and patients participate (35).

Limitations

There are several limitations which may have introduced error in our estimates of the numbers and characteristics of those potentially eligible for bariatric surgery, with most summarised in Table 1. Additionally, resistant obesity could not be classified from the AHS data, though we expect the impact of this limitation to be small because sustained weight loss is unlikely in this population group (36). In the absence of other data, we used elevated ALT as a surrogate marker of NASH (gold standard is liver biopsy for diagnosis (37)) which may have misclassified some with class 2 obesity as potentially eligible. ALT has been found to be an independent predictive marker of NASH, at least in those with a BMI ≥ 40 kg/m² (38), and a systematic review reported the estimated prevalence of NASH in the population living with obesity to be between 10-56% (median 33%) (37). Of the total population we estimated to be potentially eligible for bariatric surgery, 12.1% had class 2 obesity and became eligible only through high ALT levels. This figure appears reasonable given the NASH prevalence data available (37). Elevated ALT can arise as a result of excess alcohol intake and in a sub-analysis using the NHS, we estimated that 25% of this group had alcohol intake exceeding 20 ml/day. However, this estimation was determined from a small sample (n=24) using three-day self-report alcohol consumption data. Furthermore, there were no direct measures or surrogate indicators of GORD in the AHS. Using self-reported medication data in the NHS for the collective category GORD or peptic ulcers, we found that the sample size increased by only eight individuals or 2.2%. Therefore, the impact on our estimates from the AHS data is likely to be small. There was also the possibility of error in our estimates because of self-report inaccuracies related to disclosure of comorbidities and smoking status. Further, some participants in our sample may have already had bariatric surgery and of those classified as potentially eligible, not all would want surgery and some may be unsuitable for reasons undetectable through the AHS e.g. due to clinical contraindications (5). Finally, while the

AHS was a high quality national health survey, there are limitations specific to the survey design which have been comprehensively described in the user's guide, for example, those relating to sampling variability and non-sampling error (23).

Strengths

Our findings were drawn from a large (n=31,837), comprehensive and high quality national health survey that included measured physical and biomedical characteristics. For the first time, population estimates and characteristics of those potentially eligible for bariatric surgery in Australia have been quantified and described based on the best available evidence, using categories that best approximate the national recommended eligibility criteria (5). The findings have important implications for health service planning, especially now that the inclusion of bariatric surgery in the treatment algorithm of T2DM has been widely endorsed (39).

Key findings relevant to health service planners are summarised in Box 1.

Box 1: Key findings for health service planners

- 882,441 Australian adults between 2011-13 were estimated to be potentially eligible for bariatric surgery, most of whom had class 2 (53.4% or 470,945) or 3 obesity (45.0% or 396,856).
- 35.1% (309,983) of those potentially eligible for surgery lived outside of a major city. This has implications for follow up care particularly for those bariatric surgery types that often require more follow up than others e.g. laparoscopic adjustable gastric band.
- Of those potentially eligible for bariatric surgery 52.7% (465,296) were of low socio-economic position (\leq quintile 2) and 45.8% (404,594) were without private health insurance.
- 36.7% (175,356/477,847) of those potentially eligible for surgery with private health insurance were of low socioeconomic position (\leq quintile 2). The need for re-operative bariatric surgery is relatively common, therefore, patients should be encouraged to maintain their private health insurance which may be more challenging for those experiencing socio-economic disadvantage.
- Providing access to bariatric surgery for those with class 1 obesity and poorly controlled T2DM and increased CVD risk may not unduly burden the health system if our categorisation of this group is clinically relevant.
- Potential eligibility for surgery was independently associated with more health service use.

Conclusion

Potential demand for bariatric surgery in Australia, particularly in the public health system and outside major cities, far exceeds current capacity, highlighting an immediate need for improved prioritisation guidelines for eligible patients. Further, the large number potentially eligible for bariatric surgery (n=882,441) provides a strong signal that more funding for public surgery and other effective interventions are urgently needed for this population group.

References

1. Keating C, Backholer K, Gearon E, Stevenson C, Swinburn B, Moodie M, et al. Prevalence of class-I, class-II and class-III obesity in Australian adults between 1995 and 2011-12. *Obes Res Clin Pract*. 2015;9(6):553-62.
2. Australian Institute of Health and Welfare. Weight loss surgery in Australia. Cat. no. HSE 91. Canberra; 2010.
3. Medicare. Medicare item numbers 31569, 31572, 31575, processed from January 2015 to December 2015. Canberra; 2016.
4. Chang SH, Stoll CR, Colditz GA. Cost-effectiveness of bariatric surgery: should it be universally available? *Maturitas*. 2011;69(3):230-8.
5. National Health and Medical Research Council. Clinical practice guidelines for the management of overweight and obesity in adults, adolescents and children in Australia. Melbourne; 2013.
6. Gloy VL, Briel M, Bhatt DL, Kashyap SR, Schauer PR, Mingrone G, et al. Bariatric surgery versus non-surgical treatment for obesity: a systematic review and meta-analysis of randomised controlled trials. *Bmj*. 2013;347:f5934.
7. National Heart Lung and Blood Institute. United States Department of Health and Human Services. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. Bethesda; 1998.
8. National Institute for Health and Care Excellence. Obesity: identification, assessment and management of overweight and obesity in children, young people and adults. London; 2014.
9. Yu J, Zhou X, Li L, Li S, Tan J, Li Y, et al. The Long-Term Effects of Bariatric Surgery for Type 2 Diabetes: Systematic Review and Meta-analysis of Randomized and Non-randomized Evidence. *Obes Surg*. 2014.
10. World Health Organisation. WHO Global Infobase Geneva. 2011 [Available from: <https://apps.who.int/infobase/>].
11. Alfa Wali M, Ashrafian H, Schofield KL, Harling L, Alkandari A, Darzi A, et al. Is social deprivation associated with weight loss outcomes following bariatric surgery? A 10-year single institutional experience. *Obes Surg*. 2014;24(12):2126-32.
12. Lukas N, Franklin J, Lee CM, Taylor CJ, Martin DJ, Kormas N, et al. The efficacy of bariatric surgery performed in the public sector for obese patients with comorbid conditions. *Med J Aust*. 2014;201(4):218-22.
13. Burton P, Brown W, Chen R, Shaw K, Packiyanathan A, Bringmann I, et al. Outcomes of high-volume bariatric surgery in the public system. *ANZ J Surg*. 2016;86(7-8):572-7.
14. International federation for the surgery of obesity and metabolic disorders. First IFSO global registry report. Oxfordshire; 2014.
15. Government of Tasmania - Department of Health and Human Services. Final report from the bariatric surgery careway advisory group. Hobart; 2010.
16. Government of Western Australia - Department of Health. WA health bariatric surgery plan - a standardised approach to surgery for obesity. Perth; 2012.
17. Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Review of Publicly-Funded Bariatric Surgery Policy in Australia-Lessons for More Comprehensive Policy Making. *Obes Surg*. 2016;26(4):817-24.
18. Sharman MJ, Venn AJ, Jose KA, Williams D, Hensher M, Palmer AJ, et al. The support needs of patients waiting for publicly-funded bariatric surgery – implications for health service planners *Clinical Obesity* 2016 *In press*.

19. Bhogal SK, Reddigan JL, Rotstein OD, Cohen A, Glockler D, Tricco AC, et al. Inequity to the utilization of bariatric surgery: a systematic review and meta-analysis. *Obes Surg.* 2015;25(5):888-99.
20. Fung M, Wharton S, Macpherson A, Kuk JL. Receptivity to Bariatric Surgery in Qualified Patients. *J Obes.* 2016;2016:5372190.
21. Sharman MJ, Venn AJ, Hensher M, Wilkinson S, Palmer AJ, Williams D, et al. Motivations for Seeking Bariatric Surgery: The Importance of Health Professionals and Social Networks. *Bariatric surgical practice and patient care.* 2016;11(3):104-9.
22. Australian Bureau of Statistics. *Australian Health Survey 2011-2013*, Expanded CURF, RADL. Findings based on use of ABS CURF data. Canberra; 2012.
23. Australian Bureau of Statistics. *Australian Health Survey: Users' Guide, 2011-13* Canberra. 2013 [Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4363.0.55.001Main%20Features12011-13?opendocument&tabname=Summary&prodno=4363.0.55.001&issue=2011-13&num=&view=>].
24. Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Review of Publicly-Funded Bariatric Surgery Policy in Australia-Lessons for More Comprehensive Policy Making. *Obes Surg.* 2015.
25. National Vascular Disease Prevention Alliance. Guidelines for the management of absolute cardiovascular disease risk. Melbourne; 2012.
26. Anderson KM, Odell PM, Wilson PW, Kannel WB. Cardiovascular disease risk profiles. *Am Heart J.* 1991;121(1 Pt 2):293-8.
27. Australian Institute of Health and Welfare. How many Australians have diabetes? Canberra. 2015 [Available from: <http://www.aihw.gov.au/how-common-is-diabetes/>].
28. Padwal RS, Chang HJ, Klarenbach S, Sharma AM, Majumdar SR. Characteristics of the population eligible for and receiving publicly funded bariatric surgery in Canada. *Int J Equity Health.* 2012;11(54):1475-9276.
29. Klarenbach S, Padwal RS, Wiebe N, Hazel M, Birch D, Manns B, et al. Bariatric surgery for severe obesity: a systematic review and economic evaluation. Ottawa: Canadian Agency for Drugs and Technologies in Health, Health CAfDaTi; 2010.
30. Korda RJ, Joshy G, Jorm LR, Butler JR, Banks E. Inequalities in bariatric surgery in Australia: findings from 49,364 obese participants in a prospective cohort study. *Med J Aust.* 2012;197(11):631-6.
31. Medicare. Medicare item numbers 30511, 30512, 30518 processed from July 2011 to June 2012. Canberra; 2015.
32. Price Waterhouse Coopers. Weighing the cost of obesity: A case for action. Canberra; 2015.
33. Shields M, Carroll D, Ogden CL. Adult Obesity Prevalence in Canada and the United States, NCHS data brief, no 56. Hyattsville National Center for Health Statistics. ; 2011
34. Sheppard CE, Lester EL, Chuck AW, Birch DW, Karmali S, de Gara CJ. The Economic Impact of Weight Regain. *Gastroenterol Res Pract.* 2013;2013:379564.
35. Third report of the bariatric surgery registry. Melbourne: Monash University School of Public Health and Preventive Medicine and Obesity Surgery Society of Australia and New Zealand; 2015.
36. Fildes A, Charlton J, Rudisill C, Littlejohns P, Prevost AT, Gulliford MC. Probability of an Obese Person Attaining Normal Body Weight: Cohort Study Using Electronic Health Records. *Am J Public Health.* 2015;105(9):e54-9.
37. Vernon G, Baranova A, Younossi ZM. Systematic review: the epidemiology and natural history of non-alcoholic fatty liver disease and non-alcoholic steatohepatitis in adults. *Aliment Pharmacol Ther.* 2011;34(3):274-85.

38. Morita S, Neto Dde S, Morita FH, Morita NK, Lobo SM. Prevalence of Non-alcoholic Fatty Liver Disease and Steatohepatitis Risk Factors in Patients Undergoing Bariatric Surgery. *Obes Surg*. 2015;25(12):2335-43.
39. Rubino F, Nathan DM, Eckel RH, Schauer PR, Alberti KGMM, Zimmet PZ, et al. Metabolic Surgery in the Treatment Algorithm for Type 2 Diabetes: A Joint Statement by International Diabetes Organizations. *Diabetes Care*. 2016;39(6):861-77.

Chapter 4: Review of publicly-funded bariatric surgery policy in Australia

- Lessons for more comprehensive policy making

Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ.

This paper was published in Obesity Surgery, 2016; 26(4):817-824.

Manuscript context

Given the high potential demand for publicly-funded bariatric surgery, this study sought to fill a knowledge gap regarding the level and type of advice being provided by Australian states and territories on this service.

Abstract

Objective: To determine the level of guidance provided by or to government health departments across different regions of Australia on publicly-funded bariatric surgery.

Materials and Methods: Bariatric surgery policies and guidelines were sought from each Australian state (n=6) and territory (n=2) government health department and compared in relation to their origins, level of guidance on patient eligibility and priority, as well as recommendations for patient care, including follow-up surgical services. Comparison with national guidelines on bariatric surgery from Australia, the UK and US was also made.

Results: Five of the 8 states and territories had policies or guidelines informing practice. There was little uniformity among regional guidelines and variable consistency with national guidelines (e.g. defining obesity related comorbidity). Recommendations differed on patient eligibility and none of the state documents mentioned re-operative bariatric or body-contouring surgery. There was limited guidance on prioritisation of eligible patients and gastric banding adjustments. Pre- and post-surgical multidisciplinary care was generally recommended. *Conclusion:* Policies and guidelines on publicly-funded bariatric surgery are highly variable across Australia and at times inconsistent with national guidelines. Insufficient guidance exists regarding the prioritisation of eligible patients and follow-up surgical services. These findings have implications for policy, research and practice and are particularly important in health service environments with resource constraints and inequitable patient access to services.

Introduction

Bariatric surgery is considered the most effective intervention for severe obesity (1). It is generally recommended when non-surgical approaches have failed for adults with class 2 obesity (body mass index/BMI of $\geq 35 \text{ kg/m}^2$) and obesity-related comorbidity (e.g. type 2 diabetes mellitus/T2DM) or class 3 obesity ($\geq 40 \text{ kg/m}^2$) with or without obesity-related comorbidity (1-3). It was estimated that over 340,000 bariatric surgery procedures were performed in 42 developed and developing countries in 2011, more than double that performed in 2003 (146,301) (4).

Worldwide data on the prevalence of class 2 and 3 obesity is limited, however, in Canada it was 8.9% in 2007-2009 and 14.4% in the US in 2007-2008 (5). The latest Australian Health Survey indicated that 9.6% (1.38/14.36 million) of adults were living with class 2 or 3 obesity with those in these BMI categories over-represented in areas of relative socioeconomic disadvantage (25.3% or 347,600 in the most disadvantaged fifth of areas versus 13.8% or 189,500 in the least disadvantaged) (6). Nevertheless, most bariatric surgery in Australia is conducted privately (7). In the period 2007-08, 16,982 bariatric surgery procedures were conducted (up from approximately 500 during 1998-99) but only 5.6% (958) of those were publicly-funded. The estimated Australian public hospital care cost for bariatric surgery between 2007-08 was \$12.5 million (7).

Calls for better local access to publicly-funded bariatric surgery have been growing (8-10) and there is some evidence suggesting outcomes for public patients may be similar to those of private patients in Australia (10) and elsewhere (11). However, even when larger volumes of publicly-funded bariatric surgeries are conducted relative to self or privately-funded

procedures, as seen in a number of European countries (e.g. England) (12), significant challenges in providing equitable access remain (13).

In developing policy for publicly-funded bariatric surgery there are a number of pressing issues, including waiting times and patient prioritisation, choice of surgical procedure, provision for re-operative bariatric surgery (revisions or reversals), and longer-term patient needs (e.g. body-contouring surgery) (14). Data are sparse but in Australia and Canada, patients who access the wait list for publicly-funded bariatric surgery may face long waiting times (15-17). In our experience in the Australian state, Tasmania, one factor influencing public hospital waiting periods for primary bariatric surgery is the higher prioritising of re-operative procedures.

Further, in Australia, re-operative surgery (for gastric bands at least) comprises a higher proportion of all bariatric surgery procedures in the public system than in the private system (7). In one Australian state (Victoria), 61% (168/274) of publicly-funded bariatric surgery procedures conducted in 2007-08 were re-operations (18). In another (South Australia), first time attendance at a public hospital for re-operative bariatric surgery (following a primary procedure funded privately or publicly elsewhere) had increased from 15.4% of total re-operative procedures in 2001 to 35.4% in 2013 (19). These trends may be partly due to movement from the private to the public system as insurance does not cover, or patients are unable to self-fund, further surgery (19).

In this rapidly changing field it is important to review public-bariatric surgery policy and identify gaps and opportunities for improvement, especially because the prevalence of obesity is not declining (20). The aim of this study was to establish the current level of guidance

provided to or imparted by Australian jurisdictions on the provision of publicly-funded bariatric surgery compared with other national guidelines (1-3), and to make recommendations for future policy development.

Methods

Representatives within departments of health in each Australian jurisdiction were contacted by one of the authors (MH) and asked to provide their state or territory level policy or guidelines (hereafter referred to as guidelines only) for publicly-funded bariatric surgery, (Australia is divided into 6 states and 2 territories which are responsible for public hospital provision). Individual hospitals may provide additional operational guidance on bariatric surgery, however, the purpose of this paper was to consider jurisdictional-level guidance.

Policy content was analysed and included the general characteristics of the documents (e.g. year published and authorship), patient eligibility for bariatric surgery (e.g. age, BMI, obesity related comorbidity, and exclusion criteria), prioritisation of eligible patients, pre- and post-operative care, guidelines for follow up surgical services (re-operative bariatric and body-contouring surgery and laparoscopic adjustable gastric band (LAGB) adjustments). The findings were then compared with national guidelines from Australia, the UK and US (1-3). Data extraction was conducted by an author (MS) and checked for accuracy by another (JC). Informants from each state health department were invited to check the accuracy of the data extraction and two minor corrections were made. Ethics approval and informed consent were not required because neither human participants nor animals were studied.

Results

Current status and origins of the documents

The general characteristics of the state and territory level guidelines are described in Table 1 (15, 16, 18, 21-23). The Northern Territory reported that it did not conduct publicly-funded

bariatric surgery. Although publicly-funded bariatric surgery was conducted in Queensland, there was no state level guidance. The Australian Capital Territory reported plans to fund public-bariatric surgery from 2014/15 and that relevant guidelines were being developed. The document produced by the Greater Metropolitan Clinical Taskforce (21) has been used to inform the provision of publicly-funded bariatric surgery in New South Wales (NSW), but it has not been assigned the status of policy by NSW Health. Three out of 6 documents reviewed were at least 5 years old. South Australia (SA) and Victoria (VIC) did not specify the type of bariatric surgery procedure to which the guidelines referred, unlike Tasmania (TAS) and New South Wales (NSW). LAGB was the preferred procedure in Western Australia (WA).

Table 1: General characteristics of Australian jurisdictional level guidelines on bariatric surgery

State	Public bariatric surgery conducted	Year guidelines/ policy developed	Title/Source	Type of bariatric surgery	Developed by
Australian Capital Territory	Planned 2014/2015	Under development	-	-	-
New South Wales (NSW)	Y	2009	Obesity Management Plan	LAGB, SG, RYGB, BPD/DS	Greater Metropolitan Clinical Taskforce, NSW
Northern Territory	N	-	-	-	-
Queensland	Y	-	-	-	-
South Australia (SA)	Y	2011	SA Health Elective Surgery Policy Framework and Associated Procedural Guidelines – Appendix 2 Guideline on Selection for Bariatric Surgery	Not specified	SA Health
Tasmania (TAS)	Y	2010	Final Report from the Bariatric Surgery CareWay Advisory Group	LAGB	Bariatric Surgery CareWay Advisory Group, Dept of Health and Human Services, TAS
Victoria (VIC)	Y	2009	Surgery for Morbid Obesity. Framework for Bariatric Surgery in Victoria's Public Hospitals.	Not specified	Bariatric Surgery Working Group, Dept of Human Services, VIC
Western Australia (WA)	Y	2008	WA Morbid Obesity Model of Care	LAGB preferred procedure	Health Networks Branch, Dept of Health, WA
		2012	WA Health Bariatric Surgery Plan – a standardised approach to surgery for obesity	Not specified	Health System Improvement Unit, Dept of Health, WA

Key - BPD/DS = biliopancreatic diversion/duodenal switch; LAGB = laparoscopic adjustable gastric banding; RYGB = Roux-en-Y gastric bypass; SG= sleeve gastrectomy

Patient eligibility

Table 2 describes patient eligibility criteria recommended by the states compared with national guidelines. There was some variability in age ranges of eligible patients between the states and national guidelines. All guidelines except SA's had similar BMI eligibility. No states reflected the Australian and UK's recommendation to consider bariatric surgery for those with class 1 obesity ($\text{BMI} \geq 30\text{-}34.9 \text{ kg/m}^2$) with poorly controlled diabetes and increased cardiovascular risk or recent onset of T2DM respectively. All states and national guidelines referred to diabetes mellitus as an obesity-related comorbidity.

Table 2: Recommended patient eligibility criteria for public bariatric surgery in each Australian jurisdiction compared with national guidelines

(Australia, UK, US)

State/Nation	Age (range years)	BMI (kg/m2)	Specified comorbidity and risk factors	Resistant obesity	Exclusion criteria	Other eligibility criteria
<i>New South Wales (21)</i>	16-55	≥40 OR ≥35 with obesity related comorbidity	Obesity related morbidity - T2DM, sleep apnoea, major degenerative WB joint disease and candidate for joint replacement etc	Failed weight loss techniques including dietary, exercise and behaviour modification programmes supervised within the Bariatric Programme	End organ damage, medical conditions increasing morbidity/mortality bariatric surgery risk, pregnancy anticipated 1 st 2 yrs; psychiatric issues, psychological treatment or drug dependency problems	Capacity to comply with changes required after surgery and understand associated risks; informed; motivated; acceptable surgical risks; assessed as fit for surgery by specialist physician, anaesthetist, endocrinologist, bariatric surgeon
<i>South Australia (23)</i>	18-60	35 - 45 with >1 significant comorbidity OR > 45 with ≥ 1 comorbidity	Impaired glucose tolerance, diabetes mellitus, obstructive sleep apnoea, fatty liver, impaired mobility, hypertension, cardiac failure	Obese > 5 years	Not specified	VLCD 2 mths before surgery; assessment for depression prior to or during VLCD; deemed fit for surgery by an anaesthetist; pregnancy not planned until weight stabilised; patient understands risks and commitment needed post-surgery; health conditions well managed for reasonable time
<i>Tasmania (15)</i>	18-65	>40 OR >35 with one or more significant obesity related comorbidity	Diabetes mellitus, sleep apnoea, hypertension, PCOS, OA in knees, hips or ankles, heart disease, renal or cardiac transplant, glucose intolerance, severe GORD, NASH	Not described	Uncontrolled psychosis; currently suicidal; history of repeated self-harming; active substance abuse; history of not engaging in health partnership; Prader-Willi Syndrome	Not specified

<i>Victoria (18)</i>	18-65	>40 OR >35 with comorbidity that may improve with weight loss	Hypertension requiring medication; T2DM, obstructive sleep apnoea, pulmonary hypertension, obesity hypoventilation syndrome, obesity-related cardiomyopathy, NASH, PCOS	Documented (preferably by dietitian) failure of all appropriate non-surgical interventions to achieve/maintain clinically relevant sustained weight loss.	Severe gastrointestinal disease, active cancer, unstable heart or lung disease, advanced liver disease with portal hypertension, uncontrolled obstructive sleep apnoea with portal hypertension and serious blood or autoimmune disorders, pregnancy; psychological and psychiatric issues such as active psychosis or unstable psychiatric disorder (refer to document for details)	Realistic expectations, able to commit to lifestyle changes; fully informed consent; benefits outweigh risks
<i>Western Australia (22)</i>	16-55	≥40 OR ≥35 with obesity related comorbidity	Obesity related morbidity – T2DM, hypertension, sleep apnoea, major degenerative WB joint disease and be candidate for joint replacement etc	Failed weight loss techniques including dietary exercise and behaviour modification program supervised within the Bariatric Programme	End organ damage, medical conditions increasing morbidity/mortality bariatric surgery risk, pregnancy anticipated 1 st 2 yrs; psychiatric issues, psychological treatment or drug dependency problems	Capacity to comply with changes required after surgery (deemed unlikely if patient cannot achieve some significant short term (12 months) weight loss non-surgically and understand associated risks; informed; motivated; acceptable surgical risks; assessed as fit for surgery by medical practitioner with special interest in obesity (with access to specialist general physician, endocrinologist), anaesthetist, bariatric surgeon.
<i>Australia (1)</i>	18-65	>40 OR >35 with comorbidity that may improve with weight loss OR >30 with poorly controlled diabetes and increased CV risk; >50 surgery may be an immediate consideration	Risk of CV event/mortality; hypertension; T2DM; chronic kidney disease; GORD; NASH	Not specified	Severe gastrointestinal disease, active cancer, unstable heart or lung disease, advanced liver disease with portal hypertension, uncontrolled obstructive sleep apnoea with portal hypertension and serious blood or autoimmune disorders, pregnancy	Capacity to give fully informed consent.

<i>United Kingdom</i> (2)	Not specified	≥40 OR 35-40 with significant disease that may improve with weight loss; >50 surgery is treatment of choice;	T2DM; hypertension	All appropriate non-surgical measures failed to achieve or maintain clinically meaningful weight loss	Not specified	Person has or will receive intensive management in a tier 3* service; fit for anaesthesia and surgery; committed to long-term follow-up; offer expedited assessment for bariatric surgery if BMI ≥35 with recent onset T2DM if person is receiving or will receive assessment in tier 3* service; consider assessment for bariatric surgery if BMI 30-34.9 (or lower if Asian heritage) with recent onset T2DM if person is receiving or will receive assessment in tier 3* service.
<i>United States</i> (3)	>18	≥40 OR ≥35 with comorbid conditions and at high risk for obesity related morbidity and mortality	Cardiovascular; sleep apnea; uncontrolled T2DM; weight-induced physical problems interfering with daily life	Less invasive interventions have failed	Not specified	Well informed; motivated; acceptable operative risks.

Key -*Tier 3 = Clinician led multi-disciplinary team (35); BMI = body mass index; CV = cardiovascular; GORD = gastro-oesophageal reflux disease; NASH = Non-alcoholic steatohepatitis; OA = osteoarthritis; PCOS = polycystic ovarian syndrome; T2DM = type 2 diabetes mellitus; VLCD = very low calorie diet; WB = weightbearing

Obesity-related risk factors and comorbidities referred to in some guidelines and not others included impaired glucose tolerance, hypertension, sleep apnoea, osteoarthritis, non-alcoholic steatohepatitis, polycystic ovarian syndrome, obesity hypoventilation syndrome, gastro-oesophageal reflux disease and renal and cardiovascular related pathology. Except for TAS, all states and national guidelines defined resistant obesity such as length of time living with obesity (SA) or failure to respond to non-surgical intervention (NSW, WA, VIC, Australia, UK, US). SA, the UK and US did not describe exclusion criteria. All guidelines (except TAS) made reference to additional eligibility criteria with a particular focus on psychological characteristics such as a patient's capacity to comply with changes required after surgery (NSW and WA) and a patient having realistic expectations of the outcomes of surgery (VIC).

Prioritisation of eligible patients

TAS and WA stated that generally patients eligible for bariatric surgery would be assigned a level 3 urgency category (non-urgent, recommended admission within 365 days) (Table 3). SA and VIC made reference (albeit limited) to the prioritisation of patients within urgency categories, while the other states and national guidelines did not (Table 3). SA specified that patients should be removed from the waiting list if they were not compliant with the pre-surgical very low calorie diet or if a specialist appointment was missed. VIC stated that patients should be prioritised if they have significant chronic disease (as described in Table 2).

Table 3: Prioritisation of eligible patients

State/Nation	Urgency categorisation	Prioritising of eligible patients beyond standard directives in an elective surgery policy
<i>New South Wales</i>	Not specified	Not specified
<i>South Australia</i>	Not specified	Recommended that patients removed from waitlist if non-compliant with very low calorie diet or they miss a specialist appointment
<i>Tasmania</i>	Majority assigned category 3, depending on the assessed urgency remaining assigned category 1 or 2.	Patients of same urgency treated in the order in which they are placed on the waiting list
<i>Victoria</i>	Not specified	Priority should be given to patients with significant chronic disease (as described in Table 2)
<i>Western Australia</i>	Uncomplicated elective bariatric surgery should be classified as category 3	Not specified
<i>Australia</i>	Not specified	Not specified
<i>United Kingdom</i>	Not specified	Not specified
<i>United States</i>	Not specified	Not specified

Key - Category 3: non-urgent; Category 2: semi-urgent; Category 1: urgent

Pre- and post-operative care

Similar to national guidelines, all states (except SA) referred to the need for multidisciplinary pre- and post-operative care. However, variation was seen in the types of health professionals recommended in the multidisciplinary team; only medical specialists and nurses were referred to uniformly across the states. Where specific allied health professionals were named (NSW, TAS, VIC, Australia) common to all were psychologists and dietitians.

Follow up surgical services

The states and the Australian and US national guidelines did not provide guidance on re-operative bariatric or body-contouring surgery. The UK stated that re-operations should only be conducted by highly experienced surgeons in specialist centres due to higher mortality and complication rates and that the multidisciplinary bariatric surgery team should be able to

provide information on, or access to, body-contouring surgery (e.g. apronectomy) as appropriate. TAS, VIC and WA made some recommendations for LAGB adjustments. TAS recommended that the first adjustment occurs at 8 weeks' post-surgery and then only if required post-surgery at 4 and 6 months, 6 monthly from 12, 18 and 24 months' post-surgery and thereafter annually. VIC recommended that the first adjustment occur at 4 weeks' post-surgery but provided no further advice. WA advised that the gastric band may need adjusting during pregnancy in the presence of morning sickness, heartburn or to meet changing nutritional needs during pregnancy or lactation.

Other guidance

VIC and WA stated that the bariatric surgeon should be credentialed in bariatric surgery. All states (except SA) recommended outcome monitoring, such as those related to costs, surgical and medical management and variance (NSW). The UK guidelines stated that the surgeon should submit data for a national clinical audit scheme.

Discussion

There is heterogeneity across state guidelines on publicly-funded bariatric surgery and variable consistency with national guidelines. Important policy shortfalls relate to limited guidance on the prioritisation of eligible patients and follow up surgical services. In some areas guidelines did not reflect emerging evidence and practice, for example, the recent marked shift away from LAGB to sleeve gastrectomy as the preferred procedure in the Australian private sector. From July 2013 to July 2014 52.8% (9,284/17,929) of privately-funded bariatric surgeries were sleeve gastrectomies compared to 23% (4,115/17,929) for LAGB (24). Given the limitations in public health resources, policy-makers are encouraged to provide guidance on choice of bariatric surgery procedure that is informed by cost and outcome data.

All states and the Australian and US guidelines stated 18 years as the minimum age for bariatric surgery except NSW which recommended 16 years. A recent systematic review and meta-analysis concluded that the harms and benefits of bariatric surgery for children and adolescents were not fully understood (25). Therefore, the availability of publicly-funded bariatric surgery to those under 18 years needs to be carefully considered. Further, the maximum age recommended for bariatric surgery in the documents reviewed ranged between 55 – 65 years or was not stipulated. Based on a review of the literature we cannot determine why there is variability in the maximum age ranges and how the maximum ages have been determined.

The Australian and UK guidelines recommended that bariatric surgery be considered for those with class 1 obesity ($\text{BMI} \geq 30\text{-}34.9 \text{ kg/m}^2$) with poorly controlled diabetes and increased cardiovascular risk or recent onset T2DM respectively. The states are yet to expand the eligibility criteria to include class 1 obesity.

There is some variation between the states and the national guidelines regarding the specific obesity-related comorbidities that are likely to respond to bariatric surgery – this variation was also seen in a review of several European guidelines (26). Given that there are many people potentially eligible for publicly-funded bariatric surgery, it is recommended that patients with comorbidity more likely to positively respond to bariatric surgery (as determined by high quality evidence) are prioritised.

The jurisdictions referred to other criteria for determining eligibility for bariatric surgery such as exclusion criteria related to surgical risk (e.g. medical conditions that would increase the morbidity and mortality risk of bariatric surgery). However, there were examples of criteria where the impact on the outcomes of bariatric surgery is either unknown or uncertain, such as length of time a patient has ‘resistant obesity’.

Limited guidance was provided on the prioritisation of eligible patients. Policy-makers are encouraged to develop prioritisation criteria that rank patients according to greatest clinical need for and capacity to respond positively to bariatric surgery and to avoid perverse incentives. Curtis et al have provided important advice on developing prioritisation systems for elective surgery (27).

All states (except SA) and national guidelines recommended a multidisciplinary approach to bariatric surgery. However, it is unknown whether a multidisciplinary approach achieves better outcomes – an observation shared by others (28).

A systematic review of 36 studies determined that on average 2.5% to 18.4% of patients required re-operation following primary bariatric surgery. Further, on average 13 – 25.2% of patients required another re-operative procedure (29). Hospital costs were reported as more expensive by \$4,147 (USD) and \$13,257 (USD) for LAGB and laparoscopic roux-en-Y gastric bypass re-operative surgery respectively, compared with the primary procedure (19, 29). These findings highlight the need for guidance on re-operative surgery which should distinguish between need due to complications, inadequate sustained weight loss or change in health status (e.g. see the British National Health Service Commissioning Board policy document (30)). Policy-makers are also referred to the related systematic review by The American Society for Metabolic and Bariatric Surgery Revision Task Force (31).

Removal of excess skin following rapid weight loss due to bariatric surgery may be required by some patients (conservatively estimated at 20% (14)). Aligned with NICE guidelines policy makers are encouraged to provide guidance on the availability (or not) of body-contouring surgery in the public system based on clinical indications (e.g. apronectomy due to skinfold infections) (2).

Regular adjustment of a gastric band is needed particularly in the early post-surgical phase to enhance its efficacy. From July 2013 to June 2014 there were 96,630 privately-funded adjustments conducted in Australia (32). Guidance on the indications for gastric banding adjustments was absent or lacking across most guidelines reviewed – a deficit policy-makers are encouraged to rectify.

All states (except SA) acknowledged the importance of outcome monitoring. We agree with Lukas et al that strategies to improve access to publicly-funded bariatric surgery are important (10). However, there is a need for more information about patient characteristics and short- and long-term outcome data that better discriminates between surgery type. Global (12) and national registries (e.g. in the UK (33)) will assist with some shortfalls in knowledge if used by sufficient public and private hospitals.

Finally, policy-makers are encouraged to regularly update their guidelines and use recent international (e.g. (34)) and national guidelines on bariatric surgery to check levels of evidence against key policy areas. Where evidence is lacking, policy-makers can only make pragmatic decisions. Key recommendations for policy-makers are described in Box 1.

Box 1: Key recommendations for policy makers

- Use recent national and international guidelines to check levels of evidence against policy content, such as those related to eligibility criteria (e.g. age limits and obesity-related comorbidity). Update policies and guidelines to reflect new high quality evidence.
- Provide guidance on choice of bariatric surgery procedure based on outcomes and cost-effectiveness appropriate to the resource constrained public health system.
- Develop explicit prioritisation criteria that rank eligible patients according to greatest clinical need and likely capacity to benefit.
- Where possible, avoid perverse incentives whereby patients might seek priority through weight gain or poorer health.
- Recognise the life-cycle costs of bariatric surgery and provide direction on longer-term care including the:
 - provision and prioritisation of re-operative surgery that distinguishes between need due to complications versus inadequate weight or health change
 - availability (or not) of body-contouring surgery based on clinical indications (e.g. apronectomy due to skin infections)
 - indication for gastric band adjustments
- Ensure monitoring of short to long-term outcomes of bariatric surgery salient to a public health system and service improvement (e.g. complications, re-operations and weight and health changes by surgery type and the impact of variations in models of care).

Conclusion

This study has highlighted many important gaps and disparities across guidelines on publicly-funded bariatric surgery provided by or to Australian health departments, which have implications for optimal health service planning. Policy-makers are encouraged to provide greater guidance on patient eligibility and priority, type of primary surgical procedure, re-

operative and body-contouring surgery, follow-up care and outcomes monitoring. These findings can also be used by expert panels responsible for bariatric surgery guidelines.

References

1. National Health and Medical Research Council. Clinical practice guidelines for the management of overweight and obesity in adults, adolescents and children in Australia. Melbourne. 2013.
2. National Institute for Health and Care Excellence. Obesity: identification, assessment and management of overweight and obesity in children, young people and adults. United Kingdom. 2014.
3. National Heart Lung and Blood Institute. United States Department of Health and Human Services. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. Bethesda. 1998.
4. Buchwald H, Oien DM. Metabolic/bariatric surgery worldwide 2011. *Obes Surg*. 2013 Apr;23(4):427-436.
5. Shields M, Carroll D, Ogden CL. Adult Obesity Prevalence in Canada and the United States, NCHS data brief, no 56. Hyattsville National Center for Health Statistics. 2011
6. Australian Bureau of Statistics. Microdata: Australian Health Survey 2011-2012. Canberra. 2012.
7. Australian Institute of Health and Welfare. Weight loss surgery in Australia. Cat. no. HSE 91. Canberra. 2010.
8. Edye M, Talbot ML. Inequalities of access to bariatric surgery in Australia. *Med J Aust*. 2014 Nov 3;201(9):502-503.
9. Korda RJ, Joshy G, Jorm LR, Butler JR, Banks E. Inequalities in bariatric surgery in Australia: findings from 49,364 obese participants in a prospective cohort study. *Med J Aust*. 2012 Dec 10;197(11):631-636.
10. Lukas N, Franklin J, Lee CM, Taylor CJ, Martin DJ, Kormas N, et al. The efficacy of bariatric surgery performed in the public sector for obese patients with comorbid conditions. *Med J Aust*. 2014 Aug 18;201(4):218-222.
11. Alfa Wali M, Ashrafian H, Schofield KL, Harling L, Alkandari A, Darzi A, et al. Is social deprivation associated with weight loss outcomes following bariatric surgery? A 10-year single institutional experience. *Obes Surg*. 2014 Dec;24(12):2126-2132.
12. International federation for the surgery of obesity and metabolic disorders. First IFSO global registry report. Oxfordshire. 2014.
13. Owen-Smith A, Kipping R, Donovan J, Hine C, Maslen C, Coast J. A NICE example? Variation in provision of bariatric surgery in England. *Bmj*. 2013;1(346).
14. Mukherjee S, Kamat S, Adegbola S, Agrawal S. Funding for postbariatric body-contouring (barioplasty) surgery in England: a postcode lottery. *Plast Surg Int*. 2014;2014:153194.
15. Government of Tasmania - Department of Health and Human Services. Final report from the bariatric surgery careway advisory group. Hobart. 2010
16. Government of Western Australia - Department of Health. WA health bariatric surgery plan - a standardised approach to surgery for obesity. Perth. 2012.
17. Christou NV, Efthimiou E. Bariatric surgery waiting times in Canada. *Canadian Journal of Surgery*. 2009 Jun;52(3):229-234.
18. Government of Victoria - Department of Human Services. Surgery for morbid obesity. Framework for bariatric surgery in Victoria's public hospitals. Melbourne. 2009.

19. Meyer SB, Booth S, Gray J, Hakendorf P, McNaughton D, Mwanri L, et al. Quantitative analysis of bariatric procedure trends 2001-2013 in South Australia: implications for equity in access and public health expenditure. *Aust Health Rev.* 2015;39:63-69.
20. Organisation for Economic and Cooperative Development. Obesity update. Paris. 2014.
21. Greater Metropolitan Clinical Taskforce. Obesity management plan. Sydney. 2009.
22. Government of Western Australia - Department of Health - Health Networks Branch. WA morbid obesity model of care. Perth. 2008.
23. Government of South Australia. South Australia Health Elective Surgery Policy Framework and Associated Procedural Guidelines – Appendix 2 Guideline on Selection for Bariatric Surgery. Adelaide. 2011.
24. Medicare. Medicare item numbers 31569, 31572, 31575, 31578, 31581, 31587 from July 2013 to July 2014. Canberra. 2014.
25. Black JA, White B, Viner RM, Simmons RK. Bariatric surgery for obese children and adolescents: a systematic review and meta-analysis. *Obes Rev.* 2013 Aug;14(8):634-644.
26. Borisenko O, Colpan Z, Dillemans B, Funch-Jensen P, Hedenbro J, Ahmed AR. Clinical Indications, Utilization, and Funding of Bariatric Surgery in Europe. *Obes Surg.* 2014 Dec 21.
27. Curtis AJ, Russell CO, Stoelwinder JU, McNeil JJ. Waiting lists and elective surgery: ordering the queue. *Med J Aust.* 2010 Feb 15;192(4):217-220.
28. National Confidential Enquiry into Patient Outcome and Death. Too Lean a Service? A review of the care of patients who underwent bariatric surgery. London. 2012.
29. Sheppard CE, Lester EL, Chuck AW, Birch DW, Karmali S, de Gara CJ. The Economic Impact of Weight Regain. *Gastroenterol Res Pract.* 2013;2013:379564.
30. National Health Service Commissioning Board. Clinical commissioning policy: Complex and specialised obesity surgery. Redditch. 2013.
31. Brethauer SA, Kothari S, Sudan R, Williams B, English WJ, Brengman M, et al. Systematic review on reoperative bariatric surgery: American Society for Metabolic and Bariatric Surgery Revision Task Force. *Surg Obes Relat Dis.* 2014 September - October;10(5):952-972.
32. Medicare. Medicare item number 30511 from July 2003 to June 2013. Canberra. 2014.
33. National Bariatric Surgery Registry. First registry report. United Kingdom. (2010).
34. Fried M, Yumuk V, Oppert JM, Scopinaro N, Torres AJ, Weiner R, et al. Interdisciplinary European Guidelines on metabolic and bariatric surgery. *Obes Facts.* 2013;6(5):449-468.
35. National Health Service England. Report of the working group into: Joined up clinical pathways for obesity. 2014.

Chapter 5: Motivations for seeking bariatric surgery: The importance of health professionals and social networks

Sharman MJ, Venn AJ, Hensher M, Wilkinson S, Palmer AJ, Williams D, Ezzy D.

This paper was published in *Bariatric Surgical Practice and Patient Care*, 2016; 11(3):104-109.

Manuscript context

This study sought to fill a knowledge gap regarding the reasons why people seek bariatric surgery. It was anticipated that the findings would be used to inform bariatric surgery models of care.

Abstract

Objective: To examine Australian patients' motivations for seeking bariatric surgery.

Background: The reasons for seeking bariatric surgery are incompletely understood. This information is needed to inform health-service planning and therapeutic decisions *Methods:*

Ten focus groups were audio-recorded, transcribed verbatim and analysed thematically.

Results: Thirty-two women and 17 men (mean age 55 years; range 23-72) who had received or were wait-listed for publicly- or privately-funded bariatric surgery engaged in the study.

Novel findings highlighted the importance of other bariatric surgery recipients, health professionals' recommendations (e.g. bariatric surgeons, medical specialists and general practitioners), the media (e.g. television shows on bariatric surgery) and having private health insurance. We also confirmed previous findings that people seek surgery for physiological and psychological health, and because of previous failed weight loss attempts and significant others (e.g. wanting to live longer for children). *Conclusion:* Many individual, societal and environmental factors influence people to seek bariatric surgery. Exposure to recipients of bariatric surgery and recommendations made by health professionals appear to be common factors prompting a surgical pathway not previously reported. Bariatric surgery uptake may spread in social networks, which has growing implications for health service planning as more people seek this pathway.

Introduction

The provision of bariatric surgery has increased worldwide (1, 2) with data from 49 countries indicating that Roux-en-Y gastric bypass, sleeve gastrectomy and laparoscopic adjustable gastric banding (LAGB) are the most common bariatric surgeries performed (45%, 37% and 10% respectively) (1). In Australia, the provision of bariatric surgery has also grown with LAGB and sleeve gastrectomies now the most common procedures conducted (3, 4). As seen internationally, the uptake of bariatric surgery in Australia is mostly by females, but unlike some other nations (e.g.UK) most bariatric surgery in Australia is privately-funded (3-5).

Previous studies investigating why people seek bariatric surgery have used either questionnaires (6-9) or in-depth interviews (10-15). These studies found that health, quality of life, physical capacity, psychological factors, employment prospects and recommendations made by others (the details of which were not reported (9)) were motivating factors. One of these studies also investigated the influence of appearance, medical conditions, physical fitness, health concerns, embarrassment and physical limitations on weight outcomes 1-3 years post-surgery and found no effect (6). Results from a recent questionnaire study indicated that web based information may also mediate the decision to have surgery, thus providing evidence that extrinsically oriented factors could also influence people to have bariatric surgery (16).

Given that individual, social and environmental factors can contribute to weight gain, it is plausible that many factors of varying contexts may also influence the decision to have surgery (17). We used a focus group method to discover if other motivating factors exist undetected through methods used in previous studies. Further, to extend on previous studies we also sought to determine if motivations for seeking surgery differ between those waiting for and those who had received surgery, by surgery funding type (private versus public) and

to more deeply explore differences between women and men. Understanding why people have bariatric surgery is important to better ensure that patient assessment and treatment plans consider patient expectations and needs.

Methods

This study was conducted in Tasmania, an island state of Australia, which has two public hospitals and three private hospitals that conduct publicly- and privately-funded bariatric surgery (principally LAGB) respectively. Over 4,500 LAGB surgeries occurred in Tasmania between July 2003 and July 2013 (predominantly in the private sector), the highest rate per-capita in Australia (18).

Design

Semi-structured focus groups were conducted, with each no longer than 1.5 hours in duration. The focus groups were same-sexed and separated by surgery funding type and whether participants were waitlisted for or had undergone surgery to explore potential differences in motivations for surgery in these distinct patient groups. Written informed consent was obtained from all participants.

Recruitment

The study was advertised in the Royal Hobart Hospital, Tasmania, three state newspapers and through radio interview. Using a stratified and randomised approach, letters were sent to publicly-funded LAGB recipients (n=127) and those on the public waitlist (n=185) by the Department of Health and Human Services (through author MH) and to privately-funded recipients of LAGB (n=180) by another author (SW, bariatric surgeon). Additionally, SW provided interested and eligible patients with the study's information sheet. To ensure confidentiality, identifying details of participants were not shared between investigators.

Procedure

At initial contact, prospective participants were provided with an overview of the study. Information was collected on the general demographic (e.g. age and highest level of education) and clinical characteristics (e.g. weight and height, time since surgery, diabetes status) of those who expressed interest in participating. This information informed subsequent purposive sampling.

One of the authors (MS) assisted or led all focus groups to enhance consistency. The discussion schedule focused on the reasons for taking a surgical pathway and how participants had become aware of the availability of bariatric surgery. The schedule was informed by a review of the literature and consultation with public health experts, policy makers, primary and tertiary health service professionals with experience in the management of obesity, qualitative and quantitative researchers and those with lived experience of obesity. Six focus groups were held in Hobart (the largest city in Tasmania with a hospital operating at the highest teaching and referral level) and four were held in Launceston (a smaller regional city with an accredited teaching hospital). Each focus group included a maximum of ten participants (19). Where interest to participate exceeded capacity (e.g. female recipients of privately-funded bariatric surgery) invited participants were selected to ensure a mix of demographic (e.g. area of residence) and clinical characteristics (e.g. time since surgery, experience of surgery related complications, weight loss and health outcomes).

Data analysis

The focus groups were audio-recorded, transcribed verbatim and de-identified. Descriptive and interpretive thematic analysis was conducted using the software NVivo 10 (QSR International, Doncaster, Victoria, Australia). Other investigators also familiar with the

transcripts confirmed the emerging themes through the process of team coding. All quotes cited below are from participants. An audit trail was kept for the project that included transcripts, question schedules, memos, notes on research team meetings, a project logbook and reflective notes.

Results

One hundred and forty-one adults over 18 years' old who had received or were waiting for bariatric surgery expressed interest in participating in the study. Ten focus groups were conducted between August and October 2014 which included: three focus groups for women (mean age 53.5, range 30-72) and two for men (mean age 59.0, range 34-69) who had received privately-funded LAGB (n=32); one focus group for women (mean age 47.8, range 23-66) and two for men (mean age 58.3, range 41-66) who had received publicly-funded LAGB (n=9); and two focus groups for women (mean age 55.0, range 46-63) and one for men (mean age 50, range 39-60) who were on the waitlist for publicly-funded LAGB (n=8). One focus group for men included those who had received either publicly- or privately funded LAGB. Additional focus groups were not conducted because data analysis during the period in which the focus groups were conducted and after the 10th focus group indicated that data saturation had been achieved. A summary of the clinical and demographic characteristics of participants (n=49) is provided in Table 1.

Table 1: Participant characteristics (n=49)

Characteristic	
Age (years)	
Mean (Range)	55 (23-72)
Sex	
Female n (%)	32 (65)
Education	
Completed year 12 or less n (%)	19 (39)
Current BMI (kg/m ²) *	
Mean (Range)	36 (21-64)
Maximum BMI (kg/m ²) *	
Mean (Range)	46 (32-68)
Surgery funding type	
Private n (%)	32 (65)
Time since primary surgery (years)	
Mean (Range)	6 (0-31)
Time on waitlist (years) **	
Mean (Range)	5 (2-7)

* self-reported; one missing because participant did not know height

** participants currently waitlisted for publicly-funded bariatric

Key: BMI body mass index

Participants indicated a preference for the term ‘overweight’ when describing their bodies, which is consistent with the literature (20). Therefore, despite differences in body mass index between participants, the term overweight was used in the focus groups.

Reasons for seeking bariatric surgery

Health:

Seeking bariatric surgery to improve health or to prevent ill-health was a common theme across all focus groups – *“I’ve got diabetes type 2 and I wanted to get rid of it (private, female). Participants discussed having surgery to prevent or improve type 2 diabetes mellitus, or to improve such conditions as high blood pressure, reflux, osteoarthritis, sleep apnoea or heart disease. Some participants felt that having bariatric surgery was going to be the difference between life and death - “But it was just health; simple as that. I had to have it done, or I was dead” (private, male).*

A few participants talked about family members dying prematurely (in their 40s or 50s) and how this had motivated them to seek surgery – *“So he [his father] had heart problems and died obese, and all these family things that were going wrong so it was obviously going to happen to me too, so I done something about it” (private, male).*

The emotional impact of excess weight:

Although most participants described being primarily motivated to have surgery because of health reasons, for some the main reason appeared to be related to the emotional impact of their weight. This theme was more commonly discussed by women - *“I couldn’t continue to be the way I was, because of the way I felt about myself and the way that other people felt about me... I had no secondary health issues to address – that wasn’t the reason at all” (private, female).*

A few participants said that reaching a certain weight acted as a trigger to seek surgery - *“three figures on the scales, that’s pretty you know, hairy”* (private, female). Both men and women talked about perceptions of their physical appearance and how this prompted seeking surgery. One participant said the trigger for him was *“purely cosmetic”* (private, male). Another said he was considering surgery before he had developed diabetes *“cause I was sick of being big. Sick of being scrutinised when I walked down the street”* (waiting list, male). Others talked about a history of fluctuating weight and one participant described the emotional impact of this - *“It became an illness – or it did become an illness for me trying to go up and down. I did go down very quickly but I’d go up twice as much, and twice as fast. And that seesawing for me was a mental illness”* (private, female).

Words such as *“guilt”, “worrying”, “disgusting”* and *“desperate”* were used to describe how some participants felt about their overweight state - *“You’ve got to be desperate to cut yourself open and then not be able to eat normally for the rest of your life”* (waiting list, female). One participant said she did not want to get up in the morning and that she ate more worrying about her situation. Another felt that her chances of finding a husband to have a baby with would improve if she lost weight. One participant talked about pursuing surgery to lose weight in order to feel authentic in her professional role in community health - *“How do I go out there when I’m obese, and tell other people how to lose weight and how to do the things themselves. So that was my turning point”* (private, female).

Mobility:

Several participants talked about mobility issues prompting a surgical pathway. Activities of daily living such as walking, dressing, cutting toenails or picking things up from the floor had become problematic for some because of their weight – *“The weight on me belly is putting too much pressure on me back. And if I drop something on the floor, it’s been known to stay*

there a week before I can bend down and pick it up (waitlist, female). Some said that they could no longer engage in activities they had previously enjoyed (e.g. playing sport or walking with the family) – *“you’d go out for a walk, and when they [the children] were little it used to be, “Oh, well we can’t go too far because of the children.” And as they got older it was, “Oh actually we can’t go too far because of mum” (private, female).*

Failed weight loss attempts:

Across all focus groups there was discussion about numerous failed weight loss attempts. Participants talked about trying many things (sometimes repeatedly) such as dieting (including commercial diets), exercise, diet pills, protein shakes, getting a dog to walk and hypnosis. Sometimes the interventions were effective but not into the longer term – *“I was at the end of my tether. Tried all the diets; didn’t work” (private, female).* Some participants talked about not being able to stop over-eating – *“I just couldn’t not overeat” (public, male).*

Given the failed weight loss attempts, some participants felt that bariatric surgery was their only option – *“I don’t think there is any other alternative [New speaker: No I don’t either-] ‘cause I’m sure we’ve all been on diets, we’ve all done exercise, we’ve all listened to the dieticians” (public, female)* and *“...how do I actually physically restrict what I’m eating and exercising to actually be half of what was standing looking at you at that point. And it was just too overwhelming” (private, female).*

Significant others (family and close friends):

There was discussion within nearly all focus groups about significant others (or the prospect of a significant other) directly or indirectly impacting the decision to have surgery. Three men talked about how their partners had encouraged them to have surgery – *“a friend of mine had, had a lap-band so my wife said you know, “Give it a try” (private, male).* Another said that because his wife was considering bariatric surgery he thought he would do the same.

While one participant added that peer pressure influenced him - *“Plus all my mates would go off – get stuck into me about the weight”* (private, male). One participant said that his brother weighing over 200kg had shocked him and when he reached 200kg he vowed, *“I won’t get any bigger...No way”* (public, male).

Two women talked about having surgery to lose weight to improve their chances of becoming pregnant – *“I just wanted a baby so desperately I was prepared to do anything”* (private, female). A desire to be around for children and grandchildren motivated some participants to have surgery, a theme which was mostly discussed by women - *“I’m going to miss out on my grandson growing up... and I just thought I have to do something”* (private, female). For some participants having the capacity to be physically active with children was particularly important to them - *“I wanted to be more active in being able to do things with him [his son] as he grow up”* (public, male).

Other bariatric surgery recipients:

Across most focus groups there was discussion about how others who had successfully lost weight as a result of bariatric surgery had prompted their decision to take a surgical pathway - *“I was inspired by a much younger girl that had lost all her weight through having a lap-band”* (private, female). Women in the waitlist groups used adjectives such as *“amazing”*, *“fantastic”*, *“nice and slim”* to describe how some of these people looked to them because of their weight loss. Two participants said the experience of bariatric surgery had been described to them as the *“best thing”* (waitlist, female) they had done in their lives. One participant said *“It was like a revelation”* (waitlist, female) when she observed her friend’s reduced appetite subsequent to bariatric surgery.

Some participants said that family members who were recipients of successful bariatric surgery had prompted them to have surgery - *“My daughter had it done before me so I*

watched her for about a year as the weight started to fall off her. And after that I thought, “Right, I’m going to give this a go” (private, female).

Another participant said her mother experienced serious complications from a sleeve gastrectomy - *“I thought she was going to die” (private, female)*, but this appeared to influence her choice of bariatric surgery procedure (preferring LAGB because of having more “control”) rather than deterring her from having surgery.

A few participants talked about their expanding network of bariatric surgery recipients. There were also a number of participants who had inspired or prompted others to have surgery following their own (e.g. family, friends and others in their community). One participant said that her experience had motivated her hairdresser to have surgery and a male participant said that a few of his friends had followed his lead - *“If you’ve had one we better bloody well have one” (private, male)*. Another participant’s impression was that the “big people” watch you *“and then if it’s successful they want to sort of be part of it themselves” (public, male)*.

Health professionals:

One participant said she had first heard about bariatric surgery through a diabetes educator. Others said it was through their GP that they first learnt about bariatric surgery and some had been encouraged by their GP to have it for weight loss and health reasons (e.g. diabetes) - *“... it all come down to the doctor made a bet with me when I had my annual check-ups, he said if you don’t lose any weight this year you’ve got to have lap-band and that’s exactly what – I lost the bet and did that” (private, male)*.

Some participants said that they went to their GP to discuss having bariatric surgery and it was because of their GP’s sanction that they continued with this pathway - *“Yep, go for it” (private, female)* and *“I think you’ve made a really wise decision” (private, female)*. One participant said that initially his GP was not supportive but later changed their mind – *“And*

the whole thing just changed completely from the first you know – “It’s your fault for not going on a diet,” to “Yeah, okay have a lap-band” (private, male).

A few participants said that they had attended information sessions conducted by a bariatric surgeon which appeared to influence their decision. One participant stated *“that was just so refreshing the way that he was explaining to me how it wasn’t my fault. I’d always felt that it was because I was eating all the wrong food and not doing enough exercise. And whilst that was probably a contributing factor, it wasn’t really the whole story” (private, male).*

Other medical specialists (e.g. endocrinologists, cardiologists and rheumatologists) had influenced some participants to have bariatric surgery by providing information or initiating referral – *“but my real trigger was a specialist, an endocrinologist actually that I’d see, and she referred me to the surgeon, and it went from there” (private, female).* For others weight loss was necessary to have further surgeries (e.g. orthopaedic, cardiac or gynaecological) – *“ There was problems with my knees. The surgeon that I had for my knees kept saying to me, “You have to lose weight before I can do the surgery on your knees.” [New speaker: Oh yeah, just like that] And it was like, “How am I going to do that?” You know, I done weightwatchers, I done Jenny Craig, I done you know all the stuff that was around at the time” (private, females).*

Other factors:

Several participants said they initially learnt about bariatric surgery through media sources, particularly television but also newspaper advertisements. Two participants said that they discussed the option of bariatric surgery with their GP after seeing a related television show. Further, having private health insurance seemed to facilitate the decision to seek bariatric surgery for some participants and how quickly the procedure could be performed appeared to be a factor that may influence the decision to go through with the surgery- *“Well I want to get*

it done as soon as I can otherwise I'm going to change my mind.” And it was a bit like the Thursday or Friday, and he said, “We can do it next week for you” (private, male).

Discussion

Our findings demonstrated that there are individual, social and environmental factors that can influence the decision to seek bariatric surgery beyond those previously published. Of novel importance was the influence of health professionals and a participant's social network (e.g. other recipients of bariatric surgery). This focus group study has also provided insights as to why motivations for seeking surgery can differ between the sexes as previously identified through questionnaires (6, 9). For example, women tended to talk more about the emotional impact of excess weight and the desire to lose weight for the sake of children or grandchildren. It is also possible that these sex differences contribute to the greater uptake of bariatric surgery by females (5).

A recurrent theme across the focus groups was how other recipients of bariatric surgery had influenced participants to take the same pathway and also the effect participants had on others to seek surgery subsequent to their own. This suggests that the uptake of surgery may be spreading in social networks. The spread of health-related behaviours or outcomes within social networks has been demonstrated in the literature, such as smoking (21) and marijuana use (22) suicidal thoughts and attempts (23) and obesity (24). It is likely that health service use would also spread within social networks but this relationship has seldom been investigated in the literature (25, 26). This is an area ripe for research given the implications for health service planning.

As previously discussed, one study has investigated the relationship between primary motivating factors and weight outcomes 1-3 years post-surgery, finding no effect (6). Our results highlighted that the decision to have surgery was often complex, and may be

influenced by a combination of factors beyond those considered primary. Whether these factors collectively or differentially impact surgical outcomes warrants investigation.

Health professionals can use knowledge of the factors motivating patients to have bariatric surgery to shape their assessment and treatment plans for patients. For example, a patient motivated to have surgery to avoid a family history of premature death from heart disease (as evidenced under 'Health') may benefit from regular cardiovascular risk assessment post-surgery - an approach that may enhance patient adherence to follow-up care (27).

Additionally, findings from two randomised control trials demonstrated that weight loss interventions (non-surgical) informed by knowledge of the reasons why people are seeking to lose weight, can achieve significantly greater weight loss compared with controls (28, 29).

Whether improved weight loss would occur following bariatric surgery using similar approaches is an area requiring investigation.

Finally, knowing why a patient is having surgery can also assist health professionals to moderate patient expectations as necessary. For example, if a patient has sought surgery because of the success of another surgical recipient, the patient may expect similar results without accounting for differences in demographic and clinical characteristics and psychosocial circumstances (as evidenced under 'Other bariatric surgery recipients').

Limitations

Given the study design we cannot infer the prevalence of these individual motivations at a population level. While data saturation was achieved by the end of the 10th focus group, it is possible other motivations for seeking surgery exist and there may have been recall error for some participants based on the length of time since surgery (Table 1). Although motivations for seeking surgery appeared similar between surgery funding type and those on the waiting list, meaningful comparisons could not be made between the groups because of the low

number of participants who were on the waiting list for or who had received publicly-funded bariatric surgery. This is an area requiring further research. Additionally, the motivations for seeking bariatric surgery may differ among people between countries and surgery type. Although it was beyond the scope of our study to investigate this, our findings suggest that such differences are unlikely, because we found that the reasons people seek surgery are similar to that reported in Europe and the US irrespective of surgery type (7, 8, 11-13, 15). Furthermore, there are still significant numbers of LAGB being conducted in Australia and elsewhere (e.g. US/Canada, France and Israel (1)). Taken together, this suggests our findings are internationally relevant.

Conclusion

Many individual, societal and environmental factors can influence the decision to have bariatric surgery. Of key importance to health service planners is that the uptake of bariatric surgery may spread in social networks, the implications of which will intensify as more people have bariatric surgery. Further, health professionals should know why patients are seeking bariatric surgery to better understand and manage patient expectations. The factors that motivate people to have surgery can also be used to inform clinical assessments and treatment plans and may help to foster patient adherence to follow-up care and improve outcomes.

References

1. Angrisani L, Santonicola A, Iovino P, Formisano G, Buchwald H, Scopinaro N. Bariatric Surgery Worldwide 2013. *Obes Surg.* 2015 Oct;25(10):1822-1832.
2. Buchwald H, Oien DM. Metabolic/bariatric surgery worldwide 2011. *Obes Surg.* 2013 Apr;23(4):427-436.
3. Australian Institute of Health and Welfare. Weight loss surgery in Australia. Cat. no. HSE 91. Canberra. 2010.
4. Medicare. Medicare item numbers 31569, 31572, 31575, processed from July 2014 to July 2015. Canberra. 2015.
5. International federation for the surgery of obesity and metabolic disorders. First IFSO global registry report. Oxfordshire. 2014.
6. Libeton M, Dixon JB, Laurie C, O'Brien PE. Patient motivation for bariatric surgery: characteristics and impact on outcomes. *Obes Surg.* 2004 Mar;14(3):392-398.
7. Munoz DJ, Lal M, Chen EY, Mansour M, Fischer S, Roehrig M, et al. Why patients seek bariatric surgery: a qualitative and quantitative analysis of patient motivation. *Obes Surg.* 2007 Nov;17(11):1487-1491.
8. Wee CC, Jones DB, Davis RB, Bourland AC, Hamel MB. Understanding patients' value of weight loss and expectations for bariatric surgery. *Obes Surg.* 2006 Apr;16(4):496-500.
9. Dixon JB, Laurie CP, Anderson ML, Hayden MJ, Dixon ME, O'Brien PE. Motivation, readiness to change, and weight loss following adjustable gastric band surgery. *Obesity (Silver Spring).* 2009 Apr;17(4):698-705.
10. Ogden J, Clementi C, Aylwin S. The impact of obesity surgery and the paradox of control: A qualitative study. *Psychol Health.* 2006;21(2):273-293.
11. Engstrom M, Wiklund M, Olsen MF, Lonroth H, Forsberg A. The meaning of awaiting bariatric surgery due to morbid obesity. *Open Nurs J.* 2011;5:1-8.
12. LePage CT. The Lived Experience of Individuals following Roux-en-Y Gastric Bypass Surgery: A Phenomenological Study. *Bariatric Nursing and Surgical Patient Care.* 2010 2010/03/01;5(1):57-64.
13. Pfeil M, Pulford A, Mahon D, Ferguson Y, Lewis MP. The Patient Journey to Gastric Band Surgery: A Qualitative Exploration. *Bariatric surgical practice and patient care.* 2013 Jun;8(2):69-76.
14. Throsby K. Happy Re-birthday: Weight Loss Surgery and the 'New Me'. *Body & Society.* 2008 March 1, 2008;14(1):117-133.
15. Wysoker A. The Lived Experience of Choosing Bariatric Surgery to Lose Weight. *Journal of the American Psychiatric Nurses Association.* 2005 February 1, 2005;11(1):26-34.
16. Paolino L, Genser L, Fritsch S, De' Angelis N, Azoulay D, Lazzati A. The Web-Surfing Bariatric Patient: the Role of the Internet in the Decision-Making Process. *Obes Surg.* 2015 Jan 27.
17. National Health and Medical Research Council. Clinical practice guidelines for the management of overweight and obesity in adults, adolescents and children in Australia. Melbourne. 2013.
18. Medicare. Medicare item number 30511 from July 2003 to June 2013. Canberra. 2015.
19. Kitzinger J. Qualitative research. Introducing focus groups. *Bmj.* 1995 Jul 29;311(7000):299-302.
20. Thomas SL HJ, Karunaratne A, Herbert D, Komesaroff PA. Being 'fat' in today's world: a qualitative study of the lived experiences of people with obesity in Australia. *Health Expectations.* 2008;11:321-330.

21. Christakis NA, Fowler JH. The collective dynamics of smoking in a large social network. *N Engl J Med*. 2008 May 22;358(21):2249-2258.
22. Ali MM, Amialchuk A, Dwyer DS. The social contagion effect of marijuana use among adolescents. *PLoS One*. 2011;6(1):e16183.
23. Abrutyn S, Mueller AS. Are Suicidal Behaviors Contagious in Adolescence?: Using Longitudinal Data to Examine Suicide Suggestion. *Am Sociol Rev*. 2014 Apr;79(2):211-227.
24. Christakis NA, Fowler JH. The spread of obesity in a large social network over 32 years. *N Engl J Med*. 2007 Jul 26;357(4):370-379.
25. Christakis NA, Fowler JH. Social contagion theory: examining dynamic social networks and human behavior. *Stat Med*. 2013 Feb 20;32(4):556-577.
26. Keating NL, O'Malley AJ, Murabito JM, Smith KP, Christakis NA. Minimal social network effects evident in cancer screening behavior. *Cancer*. 2011 Jul 1;117(13):3045-3052.
27. Atreja A, Bellam N, Levy SR. Strategies to enhance patient adherence: making it simple. *MedGenMed : Medscape general medicine*. 2005;7(1):4.
28. Kalarchian MA, Levine MD, Klem ML, Burke LE, Soulakova JN, Marcus MD. Impact of addressing reasons for weight loss on behavioral weight-control outcome. *Am J Prev Med*. 2011 Jan;40(1):18-24.
29. West DS, Gorin AA, Subak LL, Foster G, Bragg C, Hecht J, et al. A motivation-focused weight loss maintenance program is an effective alternative to a skill-based approach. *Int J Obes (Lond)*. 2011 Feb;35(2):259-269.

Chapter 6: What are the support experiences and needs of patients who have received bariatric surgery?

Sharman MJ, Hensher M, Wilkinson S, Williams D, Palmer AJ, Venn AJ, Ezzy D.

This manuscript was published in *Health Expectations*, 2015; 20(1):35-46.

Manuscript context

This study sought to fill a significant knowledge gap regarding the support needs and experiences of bariatric surgery recipients and how the support experience may influence surgical outcomes. At the end of this chapter a published letter to the editor is included as a supplement. Like chapter 5, the study findings can be used to provide advice on bariatric surgery models of care.

Abstract

Objective: To explore the support needs and experiences of patients who had received publicly- or privately-funded bariatric surgery and the importance of this support in mediating outcomes of surgery. *Methods:* Seven semi-structured focus groups were conducted. A broad interview schedule guided the discussions which were audio-recorded and transcribed verbatim. Data were analysed thematically. *Results:* Twenty-six women and 15 men with a mean age of 54 years (range 24-72) participated in the study. Participants described support needs from health professionals, significant others (family and friends), peers (bariatric surgery recipients) and the general community. Peer, dietetic and psychological support were identified as important factors influencing the outcomes (e.g. weight reduction or health improvement) or experience of bariatric surgery but were identified as infrequently received or inadequately provided. Psychological support was proposed as one of the most significant but commonly overlooked components of care. Support needs appeared higher in the first year post-surgery; when subsequent related or unrelated surgeries were required; and following significant life change such as worsening health. For some participants, deficits in support appeared to negatively influence the experience or outcomes of surgery. *Conclusion:* Providers of bariatric surgery should discuss support needs and accessibility regularly with patients especially in the first year post-surgery and following significant change in a patient's life (e.g. declined health or childbirth). Nutrition, psychological and peer support (e.g. through support groups) may be especially important for some patients.

Introduction

The provision of bariatric surgery for the treatment of obesity and related comorbidity has been increasing across both developed and developing countries (1). Bariatric surgery is generally recommended for those with intractable class 2 obesity (body mass index/BMI 35-39.9 kg/m²) and obesity-related comorbidity (e.g. type 2 diabetes mellitus) or class 3 obesity (BMI \geq 40 kg/m²) with or without obesity-related comorbidity (2-4). Although long-term outcomes from randomised controlled trials are lacking, long-term observational studies infer more durable weight loss, improved health status and reduced mortality risk following bariatric surgery compared with non-surgical interventions (5-7). The most common bariatric surgery types internationally are sleeve gastrectomy, gastric bypass and laparoscopic adjustable gastric banding (LAGB) (8).

Recommendations for multi-disciplinary or multi-modal support pre and post bariatric surgery are often provided (2-4, 9-11). However, while results from qualitative and quantitative studies on bariatric surgery may imply or directly point to various support needs of bariatric surgery recipients (e.g. addressing disordered eating behaviours, deficits in nutritional status or challenges in adjusting to post-surgical life (12-15)), high quality research is lacking on the type of support and its characteristics that are valued by recipients of bariatric surgery and how support affects surgical outcomes (3, 11, 16). Consequently, this study sought to investigate the support experience and needs of publicly- or privately-funded LAGB recipients and the impact of support on surgical outcomes. To our knowledge a study of this type has not been conducted previously. This information is important for health service planning and delivery.

Methods

This study was conducted in Tasmania, an island state of Australia, which has a population of just over 500,000 with approximately 35,000 adults estimated to have class 2 obesity or greater (17). There are two public hospitals and three private hospitals that conduct publicly- and privately-funded bariatric surgery (principally LAGB) respectively. Over 4,500 LAGB surgeries occurred in Tasmania between July 2003 and July 2013, the highest rate per-capita in Australia (18).

A multi-disciplinary model of care is recommended across most Australian jurisdictions providing publicly-funded bariatric surgery (19-21). Patients receiving publicly-funded LAGB in Tasmania, principally access additional health professional support through the private sector if they can afford to, otherwise limited support is available through the public system. Like elsewhere, websites of private bariatric surgery clinics in Tasmania indicate that other health professionals (e.g. nutritionists or dietitians) are either on staff or may be required in patient care. Generally reference to other support types (e.g. support groups) appears lacking.

Design

Data was collected through semi-structured focus groups. Significantly more females than males have bariatric surgery in the general population despite comparable levels of obesity and most bariatric surgery is privately-funded in Australia (22, 23). For these reasons the groups were same-sexed and separated by surgery funding type to enable greater exploration of differences due to these characteristics. Ethics approval was granted by the University of Tasmania's Health and Medical Human Research Ethics Committee.

Recruitment

The study was advertised in three local newspapers, through radio and within related departments at the Royal Hobart Hospital, Tasmania. Letters were sent to private LAGB patients (n=180) by one author (SW, bariatric surgeon) and by the Department of Health and Human Services (through author MH) to public LAGB patients (n=127) using a stratified and randomised approach. Additionally, SW provided interested and eligible patients with the study's information sheet. To ensure confidentiality, identifying details of participants were not shared between investigators.

Procedure

At the point of enquiry prospective participants were provided with an overview of the study and asked several demographic and clinical screening questions. This information was used to determine the general characteristics of those responding to the recruitment methods and to inform subsequent purposive sampling. Where numbers permitted participants were selectively invited to attend a focus group ensuring a mix of demographic and clinical characteristics.

Prior to engaging in the focus group, invited participants were provided with the study's information sheet and informed consent was obtained. To enhance consistency, one of the authors (MS) assisted or led all focus groups. The duration of each focus group was no longer than 1.5 hours. The discussion schedule focused on: the types of support received or desired; the impact or anticipated impact of the various types of support discussed; the barriers to receiving support; and how the surgical outcomes could be improved. The schedule was informed by a review of the literature and consultation with public health experts, policy makers, primary and tertiary health professionals, experienced qualitative and quantitative researchers and people with experience of obesity. Of the seven focus groups conducted, five

were held in Hobart (the largest city in Tasmania, with a hospital operating at the highest teaching and referral level) and two in Launceston (a smaller regional city with an accredited teaching hospital).

Data analysis

All focus groups were audio-recorded and transcribed verbatim. The transcripts were checked and de-identified. The thematic analysis was descriptive and interpretive and facilitated by use of software (NVivo 10, QSR International). The emerging themes were discussed with, and reviewed by, other investigators also familiar with the transcripts. In total the transcripts were re-read several times. All quotes cited below are from participants.

Quality control

An audit trail was kept for the project that included transcripts, question schedules, memos, notes on research team meetings, a project logbook and reflective notes.

Results

One hundred and sixteen adults over 18 years old who had received publicly- or privately-funded bariatric surgery expressed interest in being involved in the study, of which 41 participated in the focus groups. Seven focus groups were conducted between August and October 2014 which included three focus groups for females (mean age 53.3 years, range 31-72) and two for males (mean age 59.2 years, range 47-69) who had received privately-funded LAGB, and one focus group for females (mean age 48.2 years, range 24-66) and two for males (mean age 58.3 years, range 41-66) who had received publicly-funded LAGB. One focus group for males included those who had received either publicly-or privately funded LAGB. Additional focus groups were not conducted because data saturation had been

achieved. A summary of the clinical and demographic characteristics of participants is provided in Table 1.

Table 1: Participant characteristics (n=41)

Characteristic	
Age	
Mean (Range)	54 (24-72)
Gender	
Female (%)	66
Education	
Completed year 12 or less (%)	42
Current BMI*	
Mean (Range)	35 (21-62)
Maximum BMI*	
Mean (Range)	47 (32-69)
Surgery funding type	
Private (%)	78
Time since surgery (yrs)	
Mean (Range)	6 (0-11)

* self-reported

Although overweight and obesity are different measures, the participants indicated a preference for the term ‘overweight’ when describing their bodies, which is consistent with the literature (24). Therefore, despite differences in body mass index between participants, the term overweight was used in the focus groups.

While there is some evidence of sex differences in the experience of bariatric surgery (25), clear differences in support needs between the sexes were not evident in our data. Men and

women consistently discussed a similar range of support needs and experiences. Meaningful comparisons between surgery funding type could not be made due to the low number of participants who had received publicly-funded bariatric surgery. The main categories of support needs identified by participants were from health professionals, peers (recipients of bariatric surgery), significant others (family and close friends) and the general community.

Health professional support experiences and needs

Dietary support:

Diet related support experiences and needs were discussed extensively across all focus groups. A few participants talked about the benefits of receiving professional dietetic input in that it provided important reinforcement or new knowledge about the surgery or that it facilitated or helped maintain behaviour change post-surgery. For example, one participant said:

Once she [the dietitian] seen me I started to lose weight, and she also gave me some advice on how to manage the eating with the lap-band. (male, public surgery)

Some participants said that not receiving comprehensive dietetic support was unfavourable:

I mean I did see a dietitian for a short period before I had the surgery, but I had no advice on what or how to eat post-operatively and I really missed that. I can see it would have been most beneficial to have had that support. (male, public surgery)

A couple of participants said they could not access or continue to receive professional dietary support because it was too expensive. For a few participants the dietitian they had consulted lacked knowledge about the needs of bariatric surgery recipients. One participant described how this impacted them:

And it's only now that I've got a dietitian that's actually done work in the field [bariatric surgery], that she's seeing me, that I'm starting to come out the other end. (female, private surgery)

Others said that advice received did not always suit their circumstances (e.g. recommending unaffordable foods). In two focus groups it was proposed that outside of professional dietetic input, providing recipes or conducting cooking demonstrations would be helpful dietary supports.

Participants described several situations in which eating and drinking could be challenging, indicating additional areas where support may be needed. For example, many talked about the necessity to reduce food and liquid intake for a few days following a gastric band adjustment and the difficulties with eating out. Others discussed that maintaining adequate hydration was challenging particularly when cold drinks were not tolerated. Some experienced fainting, constipation or headaches that they attributed to inadequate fluid intake. Participants also talked about day-to-day variance in food tolerance suggesting difficulties in achieving a balanced diet:

It's not logical; some days you can eat something and the next day you can't [Many agree]. One day you can drink a lot and the next day you can't. But it's not logical, you can't quite figure it out. (female, private surgery)

Several participants expressed or demonstrated shortfalls in nutrition literacy. For example, a male and female spoke about their experience of iron deficiency. Another participant said it was several years after surgery before she could eat fruit and vegetables.

A summary of the key diet related support themes and additional quotes are included in Table 2.

Table 2: Key dietary support themes and examples of related verbatim quotes

Themes	Quotes
1. Benefits of professional dietary support	“I’ve got half-an-hour with her [the dietitian] to discuss things and that’s made the world of difference” (female, private surgery)
2. Impact of not receiving professional dietary support	“So you really don’t have that knowledge from a dietitian about what sort of foods are going to be good, how to maintain your nutrition, how to maintain the nourishment you need for your body. What’s all this protein stuff about that you keep hearing all the time?” (female, private surgery)
3. Shortfalls in dietary advice received	<p>“She [the dietitian] wanted me to eat all these fancy things and I thought, “I can’t afford half this stuff” (female, public surgery)</p> <p>“She [the dietitian] was telling me to eat things that clearly I couldn’t eat you know” (male, private surgery)</p>
4. Dietary challenges	<p>“So if I’m sitting in a restaurant or somebody’s dining room table I have to be very careful how much I eat, otherwise I just got to excuse myself from the table and go to the bathroom and have a spit” (male, public surgery)</p> <p>“you know you can’t eat or drink as much – particularly say ah two to three days after the adjustment and then it sort of settles down” (male, public surgery)</p>
5. Shortfalls in nutrition literacy	“...and then I got very, very, very ill from not eating enough nutritious food” (female, private surgery)

Psychological support:

Psychological support was considered by some as one of the most important but frequently overlooked components of pre- and post-bariatric surgery care and suggested as even more important than professional dietetic support. Yet, few had received psychological support and of those who spoke about seeing a psychologist the experience had been favourable:

Because you do get depressed when you're overweight. There's no shame – you know I was clinically depressed. I have now started to see a psychologist which is helping.
(female, private surgery)

There were many examples in the group discussions that signalled the potential role for psychological support. One participant stated that to some extent they had substituted alcohol for food as a means to receive the “comfort” (female, private surgery) that food had previously provided. In all focus groups, participants talked extensively about the psychological aspects of becoming or being overweight. Many shared their histories of complex relationships with food (e.g. “food addiction”, female, private surgery) and disordered eating behaviour - characteristics that were not always changed by surgery even when weight had been lost:

Mindset's massive. I cried for a month when I had my lap-band because I couldn't eat. And I was depressed, like full on depressed because I couldn't eat what I wanted to eat cause I'm addicted to food... And I didn't expect that reaction to not being able to eat food. That was amazing for me, a real eye-opener. And then in a month I was like “I really am addicted to food. I really have a problem.” (female, private surgery)

Further, adapting to the lap-band was described by one participant as “tough” (male, private surgery) and there were frequent accounts of stressful events to manage, such as dealing with food blockages or eating out. Social habits were often modified because of limitations in

what could be eaten or fearing that others would recognise that they had a LAGB because of changed eating habits. Social challenges seemed more apparent amongst those reluctant to broadly disclose their history of bariatric surgery.

Additionally, some participants spoke about their expectations of surgery and the disappointment experienced when these were not realised. Males and females talked about being dissatisfied with having excess skin. A few participants had experienced body dysmorphia – seeing their current body as its pre-surgery size even when significant weight had been lost: *“A lot of the time it doesn’t matter what weight you actually are, you’re fat still in your mind”* (female, private surgery.) Others talked about their reliance on the lap-band stating that they lacked *“self-control”* (male, public surgery) or did not trust themselves in its absence - perspectives which, for some, were reinforced when weight was rapidly regained following prolonged band deflation for clinical or personal reasons.

And I would never want it [the lap band] to come out either. Because I don’t think I trust myself. Because of that mental thing that’s never been addressed or whatever, if I had it out I reckon I’d just put all the weight back on again. That’s what scares the shit out of me. (female, private surgery)

A summary of the key psychological support themes and additional quotes are included in Table 3.

Table 3: Key psychological support themes and examples of related verbatim quotes

Themes	Quotes
1. Experience of professional psychological support	<p>“I see the psychologist, it’s just because I started to feel different. I sort of thought my friends were looking at me different. Whether I’m – I’m not a threat to them or anything because they’re all tiny and skinny. I was just starting to feel I was a bit isolated now more than before. But anyway that’s me and I’m dealing with that – because you do feel lots of different feelings” (female, private surgery)</p>
2. Indications for psychological support	<p>“...I’m still battling – my mindset never went away with the operation” (female, private surgery)</p> <p>“And how much of a trauma it is that you’ve actually got to really retrain yourself in thinking, “I’m not hungry,” because most of us have been binge eaters, and comfort eaters, and whatever. There is just so little support out there.” (female, private surgery)</p> <p>“There is a tough stuff about it, there’s nothing easy about it [New speaker: That’s right (male, public surgery)]. It drags at ya and you’ve got to work at it. And you know mentally you know you’ve got to toughen up on it.” (male, private surgery)</p> <p>“...and if I go out to dinner somewhere and I’m a bit stressed, I have to go to the toilet. I’ve not been out to dinner where I haven’t had to go and throw up what I’ve eaten because I get stressed and conscious of people – they’re probably not watching me, but I’m really conscious of what they’re thinking.” (female, private surgery)</p> <p>“Mine [excess skin] hangs down quite low – I can actually get there and [New speaker: Yeah, yeah so can I.] lift it up. And it’s frustrating and you sort of feel embarrassed about it.” (female, public surgery)</p> <p>“I was inspired by a much younger girl – that had lost all her weight through having a lap-band. And I’m really disappointed in myself because I haven’t done the same thing.” (female, private surgery)</p>

Support from the bariatric surgeon:

Generally, the discussion across the groups indicated a desire for comprehensive and accessible information about the surgery that included the longer-term. The discussion also indicated a need for information to be provided through a mix of electronic and non-electronic media to cater for individual learning styles and internet access or use. Although some participants felt they had received sufficient information others felt there were gaps e.g. in respect to excess skin, details of the procedure, necessary dietary change, complications and exercising guidelines.

It would have been good to get more support when you needed knowledge – if you could ring somebody and have a line. (male, private surgery)

A number of participants appeared to have limited knowledge of the type or potential benefits of available supports and some suggested it was the role of the surgeon to provide this information and initiate referral as needed. Others who viewed the LAGB as a tool rather than a cure appeared to take more responsibility for initiating their own additional care or seeking information, characteristics that seemed to contribute to better outcomes. For example, one participant who viewed the surgery as successful said: *“I make myself go back regularly [to the surgeon] because I’ve had problems with mine and make sure that I’m being as proactive as you’re allowed to be.” (female, private surgery).*

A few participants had not seen the surgeon for a long time (e.g. several years) even when surgery related difficulties (e.g. complications) had been experienced. For some of these participants it appeared that more regular follow-up with the surgeon could have been helpful e.g. those experiencing enduring dietary challenges or complications. One participant who had less weight loss success than others said:

I've never been back to the surgeon since, and that was about six years ago; and I won't. And maybe – it's just not right not being able to eat all the good things and still being able to eat crap, you know and that's what you're sustained on; rubbish.
(female, private surgery)

Further, although some participants had experienced significant surgery related difficulties (e.g. complications) these experiences did not necessarily adversely influence how they felt about having a LAGB. This could be linked to the attitude conveyed by some that the surgery was their last opportunity to reduce their weight or improve their health, suggesting that they were prepared to endure difficulties in order to realise this goal.

General practitioner support:

In all focus groups there were participants who spoke about the benefits of regularly consulting with their general practitioner (GP) particularly among those who had an extended history with the same GP. The benefits discussed included: having a single point of contact who had knowledge of their full health profile; regular monitoring of vitamin and mineral levels and general health; providing support about the decision to have LAGB; being a source of information about bariatric surgery; and providing support to engage in healthy lifestyle behaviours.

My GP's fantastic. She continues to monitor all my vitamin levels, etcetera – more regularly than I even want to think about, because she's scared of me getting ill again, and you know she's been brilliant. (female, private surgery)

However, not all participants felt that they were supported by their GP in their decision to have a LAGB, although two participants said that their GP's opinion changed when they lost weight.

Social support experiences and needs

Peer support (recipients of bariatric surgery):

Many participants spoke about the potential or realised benefits of having access to people who had received bariatric surgery to share experiences and information, both before and after their own surgery. In two focus groups it was suggested that having access to a bariatric surgery recipient who had a relevant professional background or training would be useful. For some the preferred medium for peer support was face to face, others had found social media (e.g. Facebook) to be an important and influential source of support:

So there's a lot of support there for you know people that have access and can do what they can on Facebook. (male, private surgery)

I've found social media to be a huge help for me [New speaker: Yes]. I mean there's the Tassie lap-band one, there's a Aussie lap-band one, and there's even the American ones [New speaker: I like the Tassie one]... but it's been great. It's answered a lot of questions that no one else has answered, or no one else had brought up [New speaker: Yes, I've found that]. (female, private surgery).

One participant suggested that social media provided a means to discuss related personal issues that people may feel disinclined to discuss with their doctor. Others acknowledged that the information available through social media was not always welcomed: *"But you've got to take it [social media] for what it is, and you've got to be strong enough to take what you need from it."* (female, private surgery). The general absence of a moderator was also discussed as a potential problem. However, not all participants were aware of the presence or extent of social media dedicated to recipients of bariatric surgery.

Most of the focus groups ended with participants discussing how beneficial it had been coming together and sharing their experiences and some expressed a desire to connect again.

Significant others (family and friends):

There was variety within and across the groups regarding the extent to which participants had told significant others about having bariatric surgery and the support received from those who knew of their surgery. For some there was reluctance to tell others because of negative views about the merits of bariatric surgery (e.g. it was the easy way out) or because of experiencing emotions such as embarrassment. Others talked about significant others (e.g. partners) initially being unsupportive but later changing their position when ‘success’ had been experienced. Some, but not all, participants, experienced negative consequences from not disclosing or severely limiting disclosure of their bariatric surgery to others (e.g. feeling “*depressed*” (female, private surgery)), although some felt that the alternative was also unfavourable (e.g. fear of judgement).

Many felt that support from significant others was essential: “*I couldn’t do it without my family*” (female, private surgery). However, there were also examples of significant others lacking consideration of the consequences of the surgery: “*...with my in-laws, if we go there they insist on making a sandwich. I just can’t eat bread*” (female, private surgery). A few participants discussed the benefits of significant others also being recipients of bariatric surgery. For example, one participant said she had benefited greatly from her daughter’s prior experience with a LAGB – “*I couldn’t cope without my daughter*” (female, private surgery).

The general community:

Many participants talked about the impact and extent of weight and bariatric surgery related stigma and discrimination experienced in the general community, including within the workplace, health and media sectors. One participant felt she had to continually prove that she “*wasn’t the lazy that goes with the fat*” (female, private surgery). Others felt that they were treated as if they were “*moronic*” (female, public surgery) because of their overweight

bodies and another said that she felt more respected by others after having lost weight following surgery. Some participants talked about a perception in the general community that having bariatric surgery “*was the coward’s way out*” (male, private surgery) and how incorrect this attitude was because life with a LAGB can be “*tough*”, “*there’s nothing easy about it*” (male, private surgery). There was also discussion about the lack of community understanding about how difficult it is to lose weight and maintain the loss as evidenced by receipt of comments such as “*I don’t know why anyone would want to have that operation it’s not worth the money, it’s not worth anything. If they just ate right, if they just exercise right they wouldn’t need the operation*” (male, private surgery).

However, others talked positively about the support they had received from their extended communities including within the workplace. One participant discussed the reaction from work colleagues when he told them he had a LAGB: “*Well good on you, it’s good to see that you’ve finally had something done to fix some of the problems*” (male, public surgery).

Another felt it was unnecessary to tell work colleagues because she considered their support unimportant. One participant spoke about how supportive people had been in the town where she lived and how it had inspired her “*not to bail*” (female, private surgery) and to try her best to make the LAGB work for her.

Critical periods for support

Discussion across the groups indicated support needs were likely to be higher in the first year following surgery when learning to adapt to the requisite behaviour change. One participant said she had “*never been more fragile*” in the first year after surgery. Another participant outlined why he thought the first year was so challenging:

You know the truth’s the truth, let’s face it – every big person loves food, eats fast, and eats plenty of it you know. You know so we’ve had lap-band surgery and we’ve

adjusted it up so now the psychology of it where we can't eat fast, we can't eat a lot of it and that's probably the most difficult part over the [first] 12 months. (male, public surgery)

Further, there were several vulnerable times for weight regain discussed: if band deflation was needed for personal or clinical reasons (e.g. subsequent surgeries) and; when there was an enduring decline in health (e.g. because of medication prescribed for comorbidity, injury or following childbirth).

...the reason I'm 10 kilos over my goal weight at the moment is I had the lap-band relaxed so I could go to that [special event]... and I use the device as a crutch. I don't actually have a lot of self-control. (male, public surgery)

And then I was in a car accident last year and ... I put on weight again because I couldn't do any exercises at all. (female, public surgery)

Discussion

The numerous, diverse, individualised and ongoing support needs described by participants highlights the complex experiences of obesity and its surgical treatment. The chronic nature of obesity also implies that bariatric surgery may be distinct from other types of elective surgery. Further, the need for comprehensive support and its impact on some participants is unsurprising given that: the suppression of hunger through bariatric surgery addresses one aspect of the often multi-faceted issue of overweight (2); significant sustained behaviour change unique to the procedure is needed following surgery and; patients may experience surgery related complications (26, 27) .

Psychological and dietary needs were discussed extensively across the focus groups, although few participants had received assistance from psychologists or dietitians which may have influenced surgical outcomes. Guidelines on bariatric surgery commonly recommend a multi-

disciplinary approach which includes specialist psychological/behavioural and dietetic intervention (2-4, 9-11) but dietitians and psychologists are not uniformly incorporated into bariatric surgery models of care (16, 28). Further, there are gaps in the evidence on how best to provide these services and their effect (3, 11, 28).

The Australian national guidelines described ongoing roles for primary healthcare professionals in the management of bariatric surgery recipients that reflect some of those valued by participants in this study (2). For example, regular monitoring of general health and providing support to engage in healthy lifestyle behaviours (2). Consequently, encouraging patients to regularly consult with their GP is recommended.

The literature commonly espouses the need for ongoing support following bariatric surgery (2, 4, 9). In our study, some participants who reported lack of follow up, particularly with the bariatric surgeon, did less well than others and reported difficulties with adjusting to the LAGB or enduring complications. Further, some participants appeared to minimise the impact of surgery-related difficulties which may be attributed to a strong desire for the surgery to be successful. This finding is a signal to health professionals that more careful discussion about the well-being of their patients may be necessary. Further, we found that participants who viewed the LAGB as a tool rather than a cure tended to talk more about their own role in the success of the LAGB and they seemed more likely to report better outcomes. This implies that patients may do better if they have realistic expectations of the outcomes of surgery.

The group discussions indicated a desire for comprehensive and accessible information about the surgery (including into the longer term) provided through both electronic and non-electronic media. Patients who have received or are planning bariatric surgery commonly use the internet to source related information (29-31), consequently this is an important medium

for health professionals to use to communicate with their patients. Guidance on components of patient education is available (11) although high quality studies in this area are lacking.

A systematic review of 10 observational studies determined that social support (support groups or support by significant others) experienced post-bariatric surgery was positively correlated with weight loss (32). The American 2013 clinical guidelines on the perioperative support of bariatric surgery recipients (10) recommended that all patients be encouraged to attend social support groups into the long-term (Grade B level evidence). Participants in this study spoke strongly about the positive or potential influence of face to face or social media peer support pre- and post-surgery. Electronic peer support has the advantage of being generally accessible although evidence on how best to provide this support still appears to be lacking subsequent to a 2004 systematic review (33). Taken together, the promotion or inclusion of social support as part of a patient's care plan should be considered.

A 2009 review by Puhl et al (34) highlighted the pervasive nature of weight based stigmatisation and discrimination across multiple sectors in society (e.g. health, education, the workplace) and the negative psychological and physiological consequences that it may induce (e.g. depression and disordered eating). Participants in this study had experienced weight based stigma and discrimination including that related to having received bariatric surgery – a finding recently reported in the literature (35). Health professionals are encouraged to consider how their practice may be perpetuating weight-based stigma and discrimination and the consequences of this.

Finally, we have identified that there may be periods post-surgery where support needs are higher e.g. in the first year following surgery or following significant change in circumstances such as declining health. Consequently, health professionals are alerted to the potential fluctuations in support needs of patients over the life of the intervention.

Our suggestions on how the outcomes of bariatric surgery may be improved through non-surgical means can be found in Box 1.

Box 1: Our suggestions on how the outcomes of bariatric surgery may be improved through non-surgical means

- Provide comprehensive and accessible information to patients through a combination of electronic and non-electronic media
- Regularly check patient understanding of key messages particularly those that are dietary related
- Regularly discuss support needs and experiences with patients
- Evaluate the psychological needs of patients often
- Where indicated, refer patients to allied health professionals who have knowledge of bariatric surgery. If financial constraints are present, refer patients to relevant and reputable sources of information or programs that are low cost or free
- Encourage patients to regularly consult with their GP
- Minimise loss to follow up where possible
- Promote the availability and potential role of support groups
- Check for the presence of weight or bariatric surgery related stigma or discrimination in clinical practice and remediate as necessary
- Fill training gaps related to bariatric surgery in health professional education through university curricula and professional development.

Conclusion

This study has highlighted that patients' experience of support may influence the outcomes of bariatric surgery and that quantitative investigation of this relationship is warranted. Health professionals are encouraged to involve patients in determining their support needs and design consultations that ensure gaps in support are identified and remediated. Whilst it is acknowledged that some providers of bariatric surgery may include comprehensive and multi-disciplinary support, the findings of this study provide useful prompts for checking models of care. Where financial constraints exist providers of bariatric surgery are encouraged to direct patients to free or low cost support options as necessary and appropriate.

References

1. Buchwald H, Oien DM. Metabolic/bariatric surgery worldwide 2011. *Obes Surg*. 2013;23(4):427-36.
2. National Health and Medical Research Council. Clinical practice guidelines for the management of overweight and obesity in adults, adolescents and children in Australia. Melbourne. 2013.
3. National Institute for Health and Care Excellence. Obesity: identification, assessment and management of overweight and obesity in children, young people and adults. United Kingdom. 2014.
4. National Heart Lung and Blood Institute. United States Department of Health and Human Services. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. Bethesda. 1998.
5. Sjostrom L. Review of the key results from the Swedish Obese Subjects (SOS) trial - a prospective controlled intervention study of bariatric surgery. *J Intern Med*. 2013;273(3):219-34.
6. Adams TD, Davidson LE, Litwin SE, Kolotkin RL, LaMonte MJ, Pendleton RC, et al. Health benefits of gastric bypass surgery after 6 years. *JAMA*. 2012;308(11):1122-31.
7. Adams TD, Gress RE, Smith SC, Halverson RC, Simper SC, Rosamond WD, et al. Long-term mortality after gastric bypass surgery. *N Engl J Med*. 2007;357(8):753-61.
8. International federation for the surgery of obesity and metabolic disorders. First IFSO global registry report. Oxfordshire 2014.
9. Fried M, Yumuk V, Oppert JM, Scopinaro N, Torres AJ, Weiner R, et al. Interdisciplinary European Guidelines on metabolic and bariatric surgery. *Obes Facts*. 2013;6(5):449-68.
10. Mechanick JI, Youdim A, Jones DB, Garvey WT, Hurley DL, McMahon MM, et al. Clinical practice guidelines for the perioperative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient--2013 update: cosponsored by American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic & Bariatric Surgery. *Obesity (Silver Spring)*. 2013;21 Suppl 1:S1-27.
11. Blackburn GL, Hutter MM, Harvey AM, Apovian CM, Boulton HR, Cummings S, et al. Expert panel on weight loss surgery: executive report update. *Obesity (Silver Spring)*. 2009;17(5):842-62.
12. Geraci AA, Brunt A, Marihart C. The Work behind Weight-Loss Surgery: A Qualitative Analysis of Food Intake after the First Two Years Post-Op. *ISRN obesity*. 2014;2014:427062.
13. Ogden J, Avenell S, Ellis G. Negotiating control: patients' experiences of unsuccessful weight-loss surgery. *Psychol Health*. 2011;26(7):949-64.
14. Aasheim ET, Bjorkman S, Sovik TT, Engstrom M, Hanvold SE, Mala T, et al. Vitamin status after bariatric surgery: a randomized study of gastric bypass and duodenal switch. *Am J Clin Nutr*. 2009;90(1):15-22.
15. Bocchieri LE, Meana M, Fisher BL. Perceived psychosocial outcomes of gastric bypass surgery: a qualitative study. *Obes Surg*. 2002;12(6):781-8.
16. National Confidential Enquiry into Patient Outcome and Death. Too Lean a Service? A review of the care of patients who underwent bariatric surgery. London. 2012.
17. Australian Bureau of Statistics. Microdata: Australian Health Survey 2011-2012. Canberra. 2012.
18. Medicare. Medicare items 30511 processed from July 2003 to June 2013. Canberra. 2015.

19. Government of Tasmania - Department of Health and Human Services. Final report from the bariatric surgery careway advisory group. Hobart. 2010
20. Government of Victoria - Department of Human Services. Surgery for morbid obesity. Framework for bariatric surgery in Victoria's public hospitals. Melbourne. 2009.
21. Government of Western Australia - Department of Health - Health Networks Branch. WA morbid obesity model of care. Perth. 2008.
22. Australian Institute of Health and Welfare. Weight loss surgery in Australia. Cat. no. HSE 91. Canberra. 2010.
23. Australian Bureau of Statistics. Profiles of Health, Australia, 2011-13. Overweight and obesity. Canberra. 2013.
24. Thomas SL HJ, Karunaratne A, Herbert D, Komesaroff PA. Being 'fat' in today's world: a qualitative study of the lived experiences of people with obesity in Australia. *Health Expectations*. 2008;11:321-30.
25. Temple Newhook J, Gregory D, Twells L. 'Fat girls' and 'big guys': gendered meanings of weight loss surgery. *Sociol Health Illn*. 2015;37(5):653-67.
26. Campanile FC, Boru CE, Rizzello M, Puzziello A, Copaescu C, Cavallaro G, et al. Acute complications after laparoscopic bariatric procedures: update for the general surgeon. *Langenbecks Arch Surg*. 2013;398(5):669-86.
27. Brethauer SA, Kothari S, Sudan R, Williams B, English WJ, Brengman M, et al. Systematic review on reoperative bariatric surgery: American Society for Metabolic and Bariatric Surgery Revision Task Force. *Surg Obes Relat Dis*. 2014;10(5):952-72.
28. Santry HP, Chin MH, Cagney KA, Alverdy JC, Lauderdale DS. The use of multidisciplinary teams to evaluate bariatric surgery patients: results from a national survey in the U.S.A. *Obes Surg*. 2006;16(1):59-66.
29. Paolino L, Genser L, Fritsch S, De' Angelis N, Azoulay D, Lazzati A. The web-surfing bariatric patient: the role of the internet in the decision-making process. *Obes Surg*. 2015;25(4):738-43.
30. Madan AK, Tichansky DS, Speck KE, Turman KA. Internet use in the bariatric surgery patient population. *Obes Surg*. 2005;15(8):1144-7.
31. Hamoui N, Lake J, Beart RW, Anthone GJ, Crookes PF. Patterns of Internet use: bariatric versus colorectal patients in a private institution. *J Am Coll Surg*. 2004;199(2):223-8.
32. Livhits M, Mercado C, Yermilov I, Parikh JA, Dutson E, Mehran A, et al. Is social support associated with greater weight loss after bariatric surgery?: a systematic review. *Obes Rev*. 2011;12(2):142-8.
33. Eysenbach G, Powell J, Englesakis M, Rizo C, Stern A. Health related virtual communities and electronic support groups: systematic review of the effects of online peer to peer interactions. *Bmj*. 2004;328(7449):1166.
34. Puhl R, Heuer CA. The stigma of obesity: A review and update. *Obesity*. 2009;17(5):941-64.
35. Carels RA, Rossi J, Borushok J, Taylor MB, Kiefner-Burmeister A, Cross N, et al. Changes in weight bias and perceived employability following weight loss and gain. *Obes Surg*. 2015;25(3):568-70.

Supplement 1: Emergency and pre-surgical band deflation in patients with laparoscopic adjustable gastric bands: variations in practice

Sharman MJ, Hensher M, Wilkinson S, Kuzminov A, Ezzy D, Venn AJ.

This letter to the editor was published in the ANZ Journal of Surgery, 2015; 85(11):890

Manuscript context

This work identified support needs of bariatric surgery recipients related to emergency department presentations and anaesthetic requirements for non-bariatric surgeries.

We recently completed a focus group study of 26 women and 15 men who had received privately or publicly funded laparoscopic adjustable gastric band (LAGB) placement. Some participants spoke about differing anaesthetist requirements prior to subsequent unrelated surgeries and their experiences within emergency departments (ED) when there was a need to remove fluid from the LAGB, both of which highlighted variations in clinical practice.

Participants reported that some anaesthetists required LAGB deflation prior to subsequent surgeries while others did not. Not deflating the LAGB was preferred by participants because of concerns about potential weight regain if deflation was well before surgery and if the time taken to re-inflate the band to pre-surgery levels was protracted. The concern about weight gain was great, resulting in participants seeking anaesthetists who did not require LAGB deflation. To our knowledge there is only one reported randomised controlled trial on this topic which had methodological limitations. It found no difference in complication rates in a small sample of patients (n=68) who did or did not have the LAGB deflated prior to subsequent surgeries and that post-operative weight gain and the need for post-operative visits were significantly less for patients who did not have their band deflated (1). Clearly this is an area requiring additional high quality research.

A patient with a LAGB may present to ED for a variety of reasons, including trauma (2). Some participants reported that when they had attended the ED and required band deflation, the ED staff did not know how to do this. Consequently, a program has been implemented to train local ED and surgical trainees in conducting this procedure. We considered this important information to share because discussion via the International Bariatric Club Facebook page confirms this issue is experienced elsewhere.

References

1. Mittermair RP, Weiss H, Aigner F, Weissenboeck E, Lanthaler M, Nehoda H. Is it necessary to deflate the adjustable gastric band for subsequent operations? *Am J Surg*. 2003 Jan;185(1):50-53.
2. Freeman L, Brown WA, Korin A, Pilgrim CH, Smith A, Nottle P. An approach to the assessment and management of the laparoscopic adjustable gastric band patient in the emergency department. *Emerg Med Australas*. 2011 Apr;23(2):186-194.

Chapter 7: The support needs of patients waiting for publicly-funded bariatric surgery – implications for health service planners

Sharman MJ, Venn AJ, Jose KA, Williams D, Hensher M, Palmer AJ, Wilkinson S, Ezzy D.

This paper was published in Clinical Obesity, 2016; (epub ahead of print).

Manuscript context

Chapter 6 highlighted that the support needs of patients pre-surgery may still be relevant post-surgery and that the support experience may influence surgical outcomes. This study was designed to more deeply explore the support needs and potential implications of long waits for publicly-funded bariatric surgery by using both focus group and individual interview data.

Abstract

The objective of this study was to investigate the experience of waiting for publicly-funded bariatric surgery in an Australian tertiary healthcare setting. *Methods:* Focus groups and individual interviews involving people waiting for, or who had undergone publicly-funded bariatric surgery, were audio-recorded, transcribed and analysed thematically. *Results:* Eleven women and six men engaged in one of six focus groups in 2014 and an additional 10 women and nine men were interviewed in 2015. Mean age was 53 years (range 23-66), mean waiting time was six years (range 0-12) and mean time since surgery was 4 years (range 0-11). Waiting was commonly reported as emotionally challenging (e.g. frustrating, depressing, stressful) and often associated with weight gain (despite weight-loss attempts) and deteriorating physical health (e.g. development of new or worsening obesity-related comorbidity or decline in mobility) or psychological health (e.g. development of or worsening depression). Peer support, health and mental health counselling, integrated care and better communication about waitlist position and management (e.g. patient prioritisation) were identified support needs. *Conclusion:* Even if wait times cannot be reduced, better peer and health professional supports, together with better communication from health departments, may improve the experience or outcomes of waiting and confer quality of life gains irrespective of weight loss.

What is already known about this subject?

- Publicly-funded bariatric surgery can be preceded by long waits. To date, few studies have investigated the experience of waiting for bariatric surgery and all are Canadian.
- These studies highlighted that waiting for publicly-funded bariatric surgery in Canada can be emotionally difficult, may be associated with declining health and some people die from obesity-related disease before receiving surgery.
- A 2010 systematic review of bariatric surgery economic studies (n=11) and clinical trials (n=63), identified that data was lacking on the economic, clinical, and psychosocial consequences of long waits for bariatric surgery.

What does your study add?

- Lack of communication from those managing the waitlist appeared to add to the emotional burden of waiting for bariatric surgery. For example, patients reported feeling angry and frustrated and disillusioned with the system as a result.
- Gaps in peer and health professional supports appeared to contribute to declining psychological or physiological health while waiting for surgery (e.g. the worsening of or development of new obesity related comorbidity or weight gain).

Introduction

The provision of bariatric surgery has been increasing worldwide as an effective treatment for obesity and associated comorbidity (1). It is generally considered for adults with resistant class 3 obesity (body mass index (BMI) ≥ 40 kg/m²) or resistant class 1 or 2 obesity (BMI 30-34.99 and 35-39.9 kg/m² respectively) combined with specific obesity-related comorbidity (2, 3).

In the period 2011-12, approximately 4 million adult Australians or 27.2% of the adult population were estimated to be living with obesity (4). Despite obesity being more prevalent in areas of socio-economic disadvantage (4), access to publicly-funded bariatric surgery is limited in Australia (<10% of bariatric surgery is publicly-funded) and like elsewhere (e.g. Canada) there is evidence of prolonged wait times (5-7).

Only a few studies have investigated the experience of waiting for publicly-funded bariatric surgery and all were Canadian. These studies highlighted that waiting (average wait time in Canada was estimated at >5 years in 2007 (5)) can be emotionally difficult, that it may be associated with declining health and that some people die from obesity-related comorbidity whilst waiting (5, 8-10). Although in another Canadian study, a 1.5-2 year wait period did not result in notable weight gain or cardiovascular morbidity in 150 participants (11). A 2009 systematic review of 27 studies on the patient perspective of waiting for any type of elective surgery (principally coronary artery bypass graft, joint replacement and cataract surgery), concluded that the experience of waiting was not fully understood (e.g. the association between waiting and ill-health) (12). A 2010 systematic review of bariatric surgery economic studies (n=11) and clinical trials (n=63), identified that data was lacking on the economic, clinical, and psychosocial consequences of long waits for bariatric surgery (13).

Consequently, the objective of this study was to investigate the patient experience of waiting for publicly-funded bariatric surgery with a particular focus on the support experience and needs of patients, in an Australian tertiary public health setting, in the island state Tasmania. Tasmania has two public hospitals that conduct publicly-funded bariatric surgery (principally laparoscopic adjustable gastric banding (LAGB)). As at December 31, 2013 there were 204 patients waiting for this service, and on average 20-30 primary procedures were conducted annually in the period 2010 to 2014 (Personal communication, MH, Director of Monitoring, Reporting & Analysis, Department of Health and Human Services, Tasmania).

Methods

Design

Qualitative methods, in particular focus groups and individual interviews, were selected because they are the best practice methods for examining individual meanings and experience (14-16). Focus groups provide data on shared group understandings and practices, while individual interviews enable more detailed analysis of individual meanings (15, 16, 17). Semi-structured focus groups (up to 1.5 hours in duration) were conducted in 2014, involving individuals who were waiting for or who had received publicly- or privately-funded bariatric surgery. This study was concerned with only those who had taken a publicly-funded pathway because of the associated long wait for publicly-funded surgery. A focus group proceeded if several people with the necessary similar characteristics expressed interest in participating. To enable deeper exploration of important themes that arose in the focus groups relevant to health service planning (e.g. the physiological and psychological impact of waiting, support experiences and current health-related behaviours) questions were included in the first tranche of a series of interviews conducted in 2015 involving people who were waiting for or had undergone publicly-funded bariatric surgery in this same year. The interviews were approximately 20-30 minutes in duration and involved only those who had not participated in

the focus groups. The focus groups were separated by sex and surgery status to explore potential differences. Written informed consent was obtained from all participants. Ethics approval was granted by the University of Tasmania's Health and Medical Human Research Ethics Committee (Reference number H0014039).

Recruitment

For the focus groups, the study was advertised in the Royal Hobart Hospital, Tasmania, three state newspapers and through radio interview. Using a stratified and randomised approach, letters were sent to publicly-funded LAGB recipients (n=127) and those waiting for surgery (n=185) by the Department of Health and Human Services through author MH. The sample was stratified in order to ensure a range of key subgroups of patients were included in the focus groups. Sampling was also randomised in order to avoid oversampling from categories that we knew were particularly numerous (e.g. females who had been waiting for surgery for more than three years compared with less than three years or females who had undergone publicly-funded bariatric surgery compared with males). Additionally, SW provided interested and eligible patients with the study's information sheet. For the individual interviews, the study information was posted to potential participants or provided at pre-operative appointments by clinic staff.

Procedure

At initial contact, prospective participants were provided with an overview of the study. Information was collected on demographic (e.g. age, sex) and clinical characteristics (e.g. weight, height, time since surgery, time on waitlist) of those who expressed interest in participating and used for subsequent purposive sampling to ensure the inclusion of a range of key subgroups.

To ensure consistency in the collection of data, one author (MS) participated in or led all focus groups and another (KJ) oversaw or led all individual interviews. The discussion schedule for the focus groups and individual interviews focused on: weight and health status and change during the wait, support received or needed during the wait, communication received about the wait process, health related behaviours during the wait and how the experience of waiting could be improved. Interviews were conducted by telephone, except for one that was conducted in person.

Data analysis

The discussions were audio-recorded, transcribed verbatim and de-identified. Thematic analysis focused on the experience of waiting and was conducted using the software NVivo 10 (QSR International, Doncaster, Victoria, Australia). Other investigators also familiar with the transcripts, confirmed the emerging themes through regular discussion and reflexive consideration of the analysis. All quotes cited below are from participants. An audit trail was kept for the project that included transcripts, question schedules, memos, notes on research team meetings, a project logbook and reflective notes.

Results

Forty-six adults aged over 18 years who had received or were waiting for publicly-funded bariatric surgery expressed interest in participating in the focus groups and 25 in the individual interviews. Six focus groups were conducted between September and October 2014 and included 17 participants. Three focus groups were held in Hobart (the largest city in Tasmania with a hospital operating at the highest teaching and referral level) and three were held in Launceston (a smaller regional city with an accredited teaching hospital). Nineteen, individual interviews were conducted between May and November 2015. Additional interviews were considered unnecessary because data analysis indicated that no new themes

were emerging, suggesting that data saturation had been achieved. A summary of the clinical and demographic characteristics of participants (n=36) are provided in Tables 1 and 2.

Table 1: The characteristics of those waitlisted for and those who had received bariatric surgery

Characteristic	Waitlisted (n=18)	Post-surgery (n=18)
Age (years)		
Mean (range)	54 (39-63)	51 (23-66)
Sex		
Female n (%)	9 (50)	12 (67)
Current BMI (kg/m ²)		
Mean (range)	49 (32-65)*	43 (27-66)
Time on waitlist (years)		
Mean (range)	6 (2-12)	5 (0-10)*
Time since primary surgery (years)		
Mean (range)	-	4 (0-11)

* one missing

Key: BMI body mass index

Table 2: The characteristics of those who participated in the focus groups and those who participated in the individual interviews

Characteristic	Focus groups (n=17)	Interviews (n=19)
Age (years)		
Mean (range)	53 (23-66)	52 (32-62)
Sex		
Female n (%)	11 (64)	9 (47)
Current BMI (kg/m ²)		
Mean (range)	42 (27-64)*	49 (32-66)
Time on waitlist (years)		
Mean (range)	5 (0-10) *	7 (4-12)
Time since primary surgery (years)		
Mean (range)	7 (2-11)	0 †

* one missing

†interviews only included participants who received publicly-funded surgery in 2015

Key: BMI body mass index

The psychological impact of waiting

The discussions amongst both men and women indicated that waiting was commonly emotionally burdensome (Quote 1, Table 3). Although the negative emotions of waiting were discussed by some post-surgery participants, this theme was stronger amongst those still waiting for surgery. Emotions experienced during the waiting period were reflected in expressions such as: *desperate, worried, frustrating, depressing, given up, stressful, gets you down, just want it over and done with, anxious, and languishing*. One participant said she

experienced headaches because of stress associated with waiting and another felt that his depression would have been less severe if the wait had been shorter. Another male said that whilst waiting he “*was in a fairly self-destructive mode mentally. I was quite happy to eat myself to death*” (post-surgery male, wait 4 years). A few participants (both men and women) spoke about the emotional impact of not being able to lose weight or from gaining weight during the wait (Quote 2, Table 3). Some women in the waiting list focus groups felt “*no one cares*” and that they were being unfairly blamed for the situation they were in (Quote 3, Table 3).

For many participants a lack of information provided to them or to their general practitioner (GP) about wait list position and expected time until surgery, appeared to have negative emotional consequences (Quote 4, Table 3). Only two participants said that they were given specific details about their waitlist position when they enquired. The frequency of communication reported to have been received by participants from the health department or hospital, ranged from annually, to a few times over an extended wait period (e.g. 12 years), to no communication. Some participants felt uncertain about whether they were still on the waiting list because of a lack of correspondence from the department. One participant said he was told by the hospital that he was no longer eligible for surgery because he “*was too old and ... didn’t have diabetes*” (waitlisted male, wait 6 years), but was later contacted to attend a pre-operative appointment.

Further, there were numerous accounts of a discordance between how long participants were originally told they would wait and how long they had been waiting. For example, one male said he was told the wait would be two to three years and he was now into his eighth year. Three participants talked about receiving a pre-operative appointment and subsequently anticipating surgery in the near future which did not occur (Quote 5, Table 3).

It appeared that the longer the wait, or greater the discordance between the expected and actual wait time, the more disillusioned with the system some participants became.

Discussion in the waiting list focus groups indicated suspicion of the management of the wait list, inferring dubious practices, such as the waiting period being unnecessarily protracted so that people became ineligible for the surgery because they were “*too old or too sick*” (waitlisted female, wait 2 years). Others could not understand how they could not be a priority for the surgery given their circumstances (Quote 6, Table 3). Another said he was told that he was an urgent case because “*Your diabetes is going to kill ya unless you get this weight off*” (waitlisted male, wait 7 years) and five years later he was still waiting. One participant reported that during the fourth year of waiting her level of prioritisation for surgery was actually reduced because she had lost weight. Participants said it would benefit them emotionally if more realistic information was provided. This benefit seems likely given that those participants who were told to expect a long wait were less likely to describe waiting as a negative emotional process. Two post-surgery female interviewees who had waited four and five years said waiting had not been a negative experience (Quote 7, Table 3). One of these participants said she had been told to expect a long wait.

The physiological impact of waiting

Many participants said they had gained weight during the wait period. Three participants attributed their weight gain to side effects from medication, such as for diabetes, depression or pain (Quote 8, Table 3). Reports of declining health were common and were described even when the stated wait was relatively short e.g. 2 years. A number of obesity-related conditions were reported to have developed or worsened during the wait e.g. sleep apnoea, heart conditions, arthritis, type 2 diabetes mellitus, chronic pain, high blood pressure and fatty liver (Quote 9, Table 3). One participant said she was considering removing herself from the waitlist now that she had developed diabetes, a condition she had hoped surgery

would prevent. However, while not all participants' health appeared to have worsened, quality of life may still have declined (Quote 10, Table 3).

A few participants talked about their mobility deteriorating whilst waiting (Quote 11, Table 3), which for two participants appeared to be because of arthritis. One participant said she had to give up her volunteer work because of deteriorating mobility and another who had two knee replacements during the wait period, said she could not work because of her knees.

Health related behaviours during the wait

Despite common reports of a history of failed weight-loss attempts, many male and female participants said they still tried to lose weight whilst waiting (mostly through what appeared to be self-directed change to diet or physical activity) and some had done so specifically to prepare for surgery. Sometimes the changes participants reported to have made to their diets appeared inappropriate (Quote 12, Table 3), while others suggested it was difficult to eat well because healthy food was expensive. Only a few participants appeared to have experienced sustained weight-loss during the wait (e.g. a few kilos up to 27kg) (Quote 13, Table 3), but the success did not appear to change the desire to have surgery (Quote 14, Table 3). One female participant who reported having poorly controlled diabetes and weight gain due to diabetic medication, believed that she was “*doing all the right sort of things*” (waitlisted female, wait 9 years), but felt she was not benefiting from these behaviours. Another said that he stopped walking regularly because “*nothing happened*” (waitlisted male, wait 8 years) and a male participant said he had given up trying, because despite his efforts his weight continued to increase. Even when there was a desire to engage in more physical activity, perceived barriers such as excess weight, cost, immobility, pain, poor health or fatigue could prevent this (Quote 15, Table 3).

Aside from attempts at weight-loss, some male and female participants talked about preparing for surgery by changing their diet to mimic the change required post-surgery (e.g.

eating liquefied food, eating slowly, chewing food well and reducing food intake), seeking psychological support, exercising, reading related literature or “*mentally*” preparing themselves. However, one participant said that because the date of surgery was unknown preparing for surgery was futile (Quote 16, Table 3).

Support during the wait

A number of male and female participants talked positively about the support they had received from their GP during the wait period. This included monitoring their health, providing information about the surgery and attempting to get information about expected wait time, which was seldom forthcoming (Quote 17, Table 3). Except for the surgical or medical management of comorbidities, participants rarely spoke about accessing support through other health professionals or relevant programs specifically for the challenges they were facing whilst waiting. This apparent lack in seeking support may be linked to participants’ stories (mostly told by females in the waiting list focus groups) about sometimes being dissatisfied with their interaction with health professionals for reasons such as: perceiving that there was a lack of understanding of their situation; that unsuitable advice had been provided (e.g. recommending unaffordable foods); that advice received conflicted between health professionals (e.g. dietary and diabetes management related advice - Quote 18, Table 3); or that inappropriate comments were made about their weight or clinical circumstances. One participant spoke about the frustration associated with being told that she needed to lose weight whilst waiting, stating “*If I could lose weight I would have done it 40 years ago...And I wouldn’t be here now*” (waitlisted female, wait 2 years).

Many men and women talked about feeling supported by significant others (partners, friends or children) during the wait period. However, support from significant others was not universally received. This was exemplified by one participant who said that her sister was

“dead against it [bariatric surgery]”, but would also try to sabotage her efforts at weight-loss “rather than encourage me. And it really gets me upset” (waitlisted female, wait 7 years).

Another participant said that she only told her mother and ex-husband about the prospect of surgery, because of cruel weight-related remarks made by other family members (Quote 19, Table 3). Male and female focus group participants talked about how helpful it had been sharing experiences (Quote 20, Table 3). One female in the waiting list focus group received encouragement from other participants when she suggested that a support group might benefit those waiting for surgery.

Table 3: Collation of quotes

Quote #	Quote	Characteristics
The psychological impact of waiting		
1	<i>... just waiting on the surgery, it's amazing how it crunches you – you know your self-worth. And you start to question you know am I worth having the surgery? Am I worth you know – to professionals I mustn't be worth helping.</i>	F; WL; WT 6
2	<i>...my main problem is that I just can't lose the weight and I get a bit depressed about it.</i>	M; WL; WT 8
3	<i>"It's your fault you're obese, why should we help you 'cause you don't help yourself?"</i>	F; WL; WT 2
4	<i>Just any type of contact would be great. Give you some confidence to say, "Oh okay, we're getting there."</i>	M; WL; WT 5
5	<i>Well, it's extremely frustrating waiting that long and then like I said, I got called down to the pre-op and I thought well I'm sure to be in shortly and then two years later still nothing had happened. And they were very hard to contact, like I said one girl that I was talking to got fairly abrupt and a bit rude and told me not to bother ringing again, they'd ring me. It's just all very frustrating, that's all.</i>	M; WL; WT 7
6	<i>... don't you though wonder what it takes to actually have the surgery. Like what makes a priority one over someone like us?</i>	F; WL; WT 6
7	<i>I suppose it made me more determined when I could have the surgery done to make a go of it and make it successful and not abuse it...</i>	F; PS; WT 5

The physiological impact of waiting

- 8 *...I was put on “Gabapentin” and that affected my ability to stay awake during the day. It made me very lethargic and as a result of that, not doing much physical exercise and whatnot, the weight that I’d lost during my [health condition] treatment soon piled back on top of it.* M; WL; WT 6
- 9 *So, I had a stent in my heart put in, so cardio issues, that was about ten years ago, probably 11 now. I’ve got type two diabetes which is basically uncontrolled. High blood pressure, fatty liver, severe arthritis, what else was there? I think high blood pressure. I think that’s all. I’ve got depression, ... of course they’ve worsened during that time [the waiting period].* F; WL; WT 5
- 10 *... my health, like I said, has been about the same for a long time. It’s not that it’s getting worse; it’s just that it’s hard all the time and you get a bit of sick it... it’s simple little things. I don’t do them anymore because they’re too much trouble...* M; WL; WT 7
- 11 *...I can hardly walk anymore. I was walking around, I wasn’t using a stick. I had no pains in my knees, only in my back and now I have pains in my knees, my hip, my legs, and my feet.* F; WL; WT 2

Health related behaviours during the wait

- 12 *...the diabetes educator... came down to convince me that I was eating unhealthy.* F; WL; WT 6
- 13 *... I feel pretty good actually. Actually, I can run now and I don’t get puffed.* M; WL; WT 8
- 14 *...but I tried to lose the weight on my own and I managed to lose 27 kilos, but it was just taking too long.* F; PS; WT 6
- 15 *...I was reluctant to do things like get out in the garden, or do excessive physical housework. I was doing the bare minimum that I needed to do because it just made me feel tired all the time.* F; PS; WT 4

- 16 *There's no way you want to drink soup and smoothies for six months or longer. Which is why I'm not going down that type of route until I get confirmation.... It's not worth it.* M; WL; WT 5

Support during the wait

- 17 *And my doctor rang them the other day while I was there and they wouldn't tell him anything. It's not good.* M; WL; WT 7
- 18 *... no matter how many people you see, they all have a different opinion. Their opinion is correct and you're left to juggle what you can afford and what you can do to please everyone so you're not ... feeling bad when you go and say, "Well look I couldn't do that or I couldn't do that this week," but you know – it puts you in a really awkward position. It makes you feel very uncomfortable. And so if the health professionals could just get it right, then maybe we could have a chance of doing something positive if they were all on the same page.* F; WL; WT 6
- 19 *"Oh aren't you uncomfortable like that? Don't you hate being fat?"* F; PS; WT 2
- 20 *...but the thing is it's been good to come and talk to someone and say, "God I feel like crap that I've been waiting," or talking to somebody else that feels the same you know...I'm not the only one going through this, there's others out there.* F; WL; WT 7

Key: F female; M male; PS post-surgery; WL wait list; WT wait time (years)

Discussion

Our findings indicated that waiting for bariatric surgery was commonly associated with a range of deleterious consequences, including weight gain and deteriorating physical or psychological health. Some of the consequences of waiting appear inevitable (e.g. emotional stress appears to be commonly associated with elective surgery waits even when wait times are relatively short (e.g. < 3 months (12)), but many deleterious effects may be improved through better communication to patients and their GPs and through peer and health professional supports. The challenge lies in determining how a public health system can provide better support for all in a resource constrained environment. This is an important area for research because the pre-surgery support experience may influence surgical outcomes (18).

To our knowledge, only two studies have investigated the effect of weight-loss interventions on patients waiting for publicly-funded bariatric surgery. In an Australian study of 82 prospective publicly-funded bariatric surgery recipients who completed a pre-hospital patient education program (involving a GP review, information session and online lifestyle behaviour modification program), 55% (n=45) maintained or lost weight and 36% (n=30) gained weight across an 18-month period. Further, at 12-month follow up post-surgery, those who completed the program had greater mean excess weight-loss (EWL) than those who did not (41.1 ± 20.3 % EWL compared with 32 ± 18.0 % ($p=0.012$)) (19). Another study of 200 participants waitlisted for publicly-funded bariatric surgery in Canada, investigated the effect of a two year individualised and interdisciplinary intervention. Thirty two percent of those in the intervention group achieved a clinically meaningful weight-loss of $\geq 5\%$ (20) compared with 17% of waitlisted patients who received no specific intervention. The proportion of those that gained $\geq 5\%$ of their body weight was comparable between the groups (11% and

13% respectively) (11). Whether the health economic benefit of such interventions outweighs the costs is unclear. Further, because these studies and others (21) indicate that non-surgical weight-loss interventions are unlikely to be effective for most in this population group, requiring patients to lose weight for non-clinical reasons to gain eligibility for surgery (as evidenced in some policy guidelines (22)) would appear inappropriate.

We have identified that there are deficits in the communication received from those managing the waitlist about waitlist management and in the support provided during the waiting period. If these deficits were remediated it could make a difference to the quality of life of bariatric surgery candidates irrespective of weight-loss. Clear communication disseminated to both patients and their GPs about waitlist position and patient prioritisation, could lessen the emotional burden of waiting for patients. Further, many participants reported that they eagerly anticipated communication from those managing the waitlist. Health authorities could use this as an opportunity to communicate information that may improve the quality of life of those waiting e.g. include health promotion messages and information about how to access free or low cost lifestyle modification programs and relevant health services.

Further, it appeared uncommon for participants to seek assistance from health professionals or through relevant programs to help them with the challenges faced whilst waiting, outside the medical management of their obesity-related conditions. Given the results of this study, many patients waiting for surgery may benefit from psychological and dietetic support and support to improve or at least maintain physical activity levels and general mobility. Whether the benefits of providing these types of supports outweighs the costs requires investigation and perceived weight-based stigma from health professionals may act as a barrier to seeking care for some patients (23).

Participants in the focus groups also talked positively about sharing their experiences, consequently the development of a support group was suggested. There was also discussion about the benefits of receiving support from family members. According to a systematic review of 10 observational studies, social support (including support groups) provided to recipients of bariatric surgery was positively associated with weight-loss (24). The effect of social support on the experience of waiting and consequent post-surgical outcomes is yet to be determined.

Individual and health system benefits may also be gained through improvements in integrated care. Participants suggested that treatments received for conditions such as diabetes, depression or pain contributed to weight gain and that advice received from health professionals was not always aligned or appropriate. A recent systematic review and meta-analysis of 27 studies investigating the effect of integrated care programs in those with chronic illness, concluded that most studies reported a beneficial outcome, such as improved quality of life, reduced hospital admissions and readmissions and improved adherence to clinical guidelines (25).

Box 1 provides a summary of strategies that may assist people waiting for bariatric surgery informed by the results of this study and the literature where available, though they are yet to be evaluated for their effectiveness.

Box 1: Recommendations that may improve the experience and outcomes of waiting

- At least annually provide patients and their GPs with information about waitlist position, expected wait time, explain delays and patient prioritisation.
- Encourage ‘active’ waiting by regularly providing patients with information on accessible low cost or free lifestyle modification programs and support services such as dietetics, counselling and support groups (face to face and on-line).
- Frequently promote to patients the importance of healthy lifestyle habits, and the potential positive health impact of improved diet and mobility or physical activity levels independent of weight-loss.
- Promote to patients the potential benefits of social support (e.g. through family and friends and online or face to face support groups) during the wait period (28).
- Where possible improve integration of care to ensure alignment and appropriateness of treatment goals for patients (25).
- Ensure training for health professionals in obesity management includes information on the impact, identification and remediation of weight based stigma or discrimination (23).

Limitations

Given the study design we cannot infer the prevalence of the focus group and interview themes at a population level. While data saturation was achieved by the final interview it is possible other relevant themes were not discussed. Further, there may have been recall error (e.g. change in health status over time) for some participants because of the prolonged wait time or time since being on the waitlist (Table 1 and 2). Due to the diversity in the residential addresses of participants within and between the focus groups and between the focus groups

and interviews we could not stratify the analysis by residential location. Whether the experience of waiting differs between those who live in major centres or in regional or remote areas is an important area of research given the potential implications for health service planning.

Strengths

This study has provided important information for health service planners. It is one of few studies that have investigated the experience of waiting for publicly-funded bariatric surgery and the first to provide an Australian perspective. Our findings appear internationally relevant (8-11) and relevant to waits associated with many types of elective surgery (especially in resource constrained public health environments), because of commonalities in our findings compared with others. For instance, evidence of declining physical, psychological or social health has also been reported to be associated with waiting for other types of elective surgery, such as cataract, cholecystectomy, joint replacements and coronary artery bypass grafting (12, 26, 27).

Conclusion

Waiting for bariatric surgery appears to be commonly associated with weight gain and physiological or psychological health decline. The consequences of waiting for publicly-funded bariatric surgery are a product of a combination of factors including the waiting time, peer and health professional supports, and communication from health departments.

Remediating communication and support deficits may improve the experience or outcomes of waiting for patients and confer quality of life gains irrespective of weight loss.

References

1. Angrisani L, Santonicola A, Iovino P, Formisano G, Buchwald H, Scopinaro N. Bariatric Surgery Worldwide 2013. *Obes Surg.* 2015;25(10):1822-32.
2. National Health and Medical Research Council. Clinical practice guidelines for the management of overweight and obesity in adults, adolescents and children in Australia. Melbourne. 2013.
3. National Institute for Health and Care Excellence. Obesity: identification, assessment and management of overweight and obesity in children, young people and adults. London. 2014.
4. Keating C, Backholer K, Gearon E, Stevenson C, Swinburn B, Moodie M, et al. Prevalence of class-I, class-II and class-III obesity in Australian adults between 1995 and 2011-12. *Obes Res Clin Pract.* 2015;9(6):553-62.
5. Christou NV, Efthimiou E. Bariatric surgery waiting times in Canada. *Canadian Journal of Surgery.* 2009;52(3):229-34.
6. Government of Tasmania - Department of Health and Human Services. Final report from the bariatric surgery careway advisory group. Hobart. 2010
7. Government of Western Australia - Department of Health. WA health bariatric surgery plan - a standardised approach to surgery for obesity. Perth. 2012.
8. Gregory DM, Temple Newhook J, Twells LK. Patients' perceptions of waiting for bariatric surgery: a qualitative study. *Int J Equity Health.* 2013;12:86.
9. Lakoff JM, Ellsmere J, Ransom T. Cause of death in patients awaiting bariatric surgery. *Can J Surg.* 2015;58(1):15-8.
10. Padwal RS, Majumdar SR, Klarenbach S, Birch DW, Karmali S, McCargar L, et al. Health status, quality of life, and satisfaction of patients awaiting multidisciplinary bariatric care. *BMC Health Serv Res.* 2012;12:139.
11. Padwal RS, Rueda-Clausen CF, Sharma AM, Agborsangaya CB, Klarenbach S, Birch DW, et al. Weight loss and outcomes in wait-listed, medically managed, and surgically treated patients enrolled in a population-based Bariatric program: prospective cohort study. *Med Care.* 2014;52(3):208-15.
12. Carr T, Teucher U, Mann J, Casson AG. Waiting for surgery from the patient perspective. *Psychol Res Behav Manag.* 2009;2:107-19.
13. Klarenbach S, Padwal RS, Wiebe N, Hazel M, Birch D, Manns B, et al. Bariatric surgery for severe obesity: a systematic review and economic evaluation. Ottawa: Canadian Agency for Drugs and Technologies in Health: Health CAfDaTi; 2010.
14. Denzin N, Lincoln Y, editors. The Sage handbook of qualitative research. Third ed. Thousand Oaks: Sage Publications; 1994.
15. Mason J. Qualitative researching. London: Sage Publications; 1996.
16. Patton M. Qualitative research and evaluation methods. Third ed. London: Sage Publications; 2002.
17. Kitzinger J. Qualitative research. Introducing focus groups. *Bmj.* 1995;311(7000):299-302.
18. Sharman M, Hensher M, Wilkinson S, Williams D, Palmer A, Venn A, et al. What are the support experiences and needs of patients who have received bariatric surgery? *Health Expectations.* 2015:n/a-n/a.
19. Brown WA, Burton PR, Shaw K, Smith B, Maffescioni S, Comitti B, et al. A Pre-Hospital Patient Education Program Improves Outcomes of Bariatric Surgery. *Obes Surg.* 2016; 26: 2074-2081.

20. Williamson DA, Bray GA, Ryan DH. Is 5% weight loss a satisfactory criterion to define clinically significant weight loss? *Obesity* (Silver Spring). 2015;23(12):2319-20.
21. Fildes A, Charlton J, Rudisill C, Littlejohns P, Prevost AT, Gulliford MC. Probability of an Obese Person Attaining Normal Body Weight: Cohort Study Using Electronic Health Records. *Am J Public Health*. 2015;105(9):e54-9.
22. Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Review of Publicly-Funded Bariatric Surgery Policy in Australia-Lessons for More Comprehensive Policy Making. *Obes Surg*. 2016;26(4):817-24.
23. Puhl R, Heuer CA. The stigma of obesity: A review and update. *Obesity*. 2009;17(5):941-64.
24. Livhits M, Mercado C, Yermilov I, Parikh JA, Dutson E, Mehran A, et al. Is social support associated with greater weight loss after bariatric surgery?: a systematic review. *Obes Rev*. 2011;12(2):142-8.
25. Martinez-Gonzalez NA, Berchtold P, Ullman K, Busato A, Egger M. Integrated care programmes for adults with chronic conditions: a meta-review. *Int J Qual Health Care*. 2014;26(5):561-70.
26. Hodge W, Horsley T, Albiani D, Baryla J, Belliveau M, Buhrmann R, et al. The consequences of waiting for cataract surgery: a systematic review. *CMAJ*. 2007;176(9):1285-90.
27. Oudhoff JP, Timmermans DR, Bijnen AB, Van der Wal G. Waiting for elective general surgery: physical, psychological and social consequences. *ANZ J Surg*. 2004;74: 361-7.
28. Livhits M, Mercado C, Yermilov I, Parikh JA, Dutson E, Mehran A, et al. Preoperative predictors of weight loss following bariatric surgery: systematic review. *Obes Surg*. 2012;22(1):70-89.

Chapter 8: Discussion and future directions

This PhD project has provided several novel contributions to the literature and important findings to facilitate improved service delivery of bariatric surgery: Australian health service planners now have significantly improved estimates of the number and characteristics of those potentially eligible for bariatric surgery; guidance has been provided on areas of bariatric surgery policy requiring development or renewal; and models of care for bariatric surgery can be informed by knowledge of the reasons why people seek bariatric surgery and the likely support needs of those taking a surgical pathway.

Demand for bariatric surgery

Using the best available evidence (2011-13 Australian Health Survey (AHS) (1)) and categories that best approximated the national recommended criteria for bariatric surgery (2), 882,441 Australian adults (18-65 years) were estimated to be potentially eligible for bariatric surgery, of which almost half were without private health insurance and approximately one third resided outside of a major city (3). Even if just 5% of those potentially eligible sought a surgical pathway, the demand for bariatric surgery would far outstrip current capacity, especially through the public health system (>90% of bariatric surgery is privately funded in Australia with approximately 18,000 procedures conducted in the financial year 2015/16 (4, 5)), and in regional areas. Clearly more funding of public surgery or other effective interventions to assist this population group are necessary. Of additional interest to Australian health service planners is that 36.7% of those potentially eligible with private health insurance were of low socio-economic position (\leq Quintile 2). This has implications for follow up surgical care, if patients are unable to retain their private health insurance and must access the public system for this service.

National and Australian jurisdictional guidance on bariatric surgery

The high potential demand for bariatric surgery pointed to a need to examine the level of guidance provided on access to and prioritisation of patients for this service. Comparing guidance between Australian states and territories and national guidelines (Australia, UK and US), highlighted little uniformity between the Australian jurisdictions and variable consistency with national guidelines (6). Important inconsistencies related to access criteria (e.g. age and body mass index) and there was minimal or no guidance on some key policy areas, such as patient prioritisation and follow up surgical services (e.g. the clinical indications for the relatively common need for re-operative and body contouring surgery (7, 8)). In addition to synthesising the contents of the guidelines and identifying gaps, a set of recommendations were provided in the manuscript to assist policy renewal and development. Combined, this work can be used to better ensure that all aspects of bariatric surgery care are considered, ideally leading to better service provision and improved outcomes for patients.

Models of care

A multidisciplinary approach to bariatric surgery with a view to optimising surgical outcomes is commonly recommended (6). However, there is a dearth of high quality research that has investigated the support needs and experiences of those taking a surgical pathway and the impact of the support experience on outcomes. Thus, the focus group and individual interview studies filled an important knowledge gap. Findings from both studies indicated that the support needs of those taking a bariatric surgery pathway in Tasmania can be numerous, diverse and ongoing and that the support experience while waiting for surgery or in the period following surgery might influence outcomes (9-12). Psychological, dietetic and peer support appeared to be especially important forms of support but these were infrequently received (10). For those experiencing prolonged waits for bariatric surgery, improvements in

support and communication from those managing the waiting list may confer quality of life gains irrespective of weight loss or reduced wait time (12). For example, lack of communication about wait list position and its management (e.g. prioritisation) appeared to have a negative emotional impact. To assist clinicians and health service planners to review or develop models of care, a quick reference guide was included in the manuscripts outlining how the outcomes of waiting for and following bariatric surgery may be improved through better support (10, 12). The usefulness of knowing why people seek bariatric surgery in order to inform assessment and treatment plans and foster adherence to follow-up care was also highlighted (11).

Future directions

While this thesis has answered some important questions it has also exposed other gaps in our understanding (as all research tends to do) needed to inform better service delivery of bariatric surgery. Two necessary areas of research this work has exposed relate to patient prioritisation and models of care. These research deficits are not only relevant to Tasmania, but also to other Australian jurisdictions and the many other countries providing bariatric surgery (13), especially where bariatric surgery is offered in resource constrained public health environments (e.g. the UK, US, Canada (14, 15)).

Findings from all studies in this thesis point to a research imperative in the area of patient prioritisation for bariatric surgery (e.g. potential demand far exceeds current capacity and guidance on patient prioritisation is largely absent). Additionally, the focus group study suggested that the demand for bariatric surgery may increase not only due to the likely increase in obesity prevalence (16), marketing of bariatric surgery (17) and recent high profile recognition of the potential role of bariatric surgery in metabolic health (18), but also because the uptake of bariatric surgery may be spreading in social networks (11). Further, the

focus group and interview studies suggested a pattern of declining health whilst waiting for bariatric surgery in Tasmania (12).

Making rationing and prioritisation decisions is challenging and in the absence of robust guidelines will become increasingly challenging as more people seek this service. Further work is needed to determine the likely proportion of those potentially eligible for bariatric surgery who actually want the intervention, the characteristics of prospective bariatric surgery recipients who have the greatest need for (given this is so poorly defined) and the capacity to respond positively to bariatric surgery and where the greatest health economic benefit will be gained. It is also unclear how clinical staff are currently making prioritisation decisions. The recently developed Edmonton Obesity Staging System (EOSS) provides a useful framework to guide transparent intervention decisions for those experiencing obesity, but it considers clinical need only and it is unknown whether using this system results in better patient outcomes (Table 1) (19). However, the EOSS provides an important step towards more equitable patient prioritisation because of the inclusion of clinical indices in addition to commonly used anthropometric measures (e.g. body mass index).

An interdisciplinary and collaborative approach will be needed to develop fair prioritisation and rationing models for bariatric surgery. Program budgeting and marginal analysis (PBMA) represents such an approach. It is systematic, consultative and draws on the evidence base to inform priority setting and is increasingly being used in the health setting (20, 21). Its usefulness in aiding decision making in the resource allocation of bariatric surgery is worthy of investigation.

Table 1: Edmonton Obesity Staging System

<i>Stage</i>	<i>Description</i>	<i>Recommended Treatment</i>
0	Patient has no apparent obesity-related risk factors (e.g., blood pressure, serum lipids, fasting glucose, etc. within normal range), no physical symptoms, no psychopathology, no functional limitations and/or impairment of well-being.	Identification of factors contributing to increased body weight. Counselling to prevent further weight gain through lifestyle measures including healthy eating and increased physical activity.
1	Patient has obesity-related subclinical risk factor(s) (e.g., borderline hypertension, impaired fasting glucose, elevated liver enzymes, etc.), mild physical symptoms (e.g., dyspnoea on moderate exertion, occasional aches and pains, fatigue, etc.), mild psychopathology, mild functional limitations and/or mild impairment of well-being.	Investigation for other (non-weight related) contributors to risk factors. More intense lifestyle interventions, including diet and exercise to prevent further weight gain. Monitoring of risk factors and health status.
2	Patient has established obesity-related chronic disease(s) (e.g., hypertension, type 2 diabetes, sleep apnoea, osteoarthritis, reflux disease, polycystic ovary syndrome, anxiety disorder, etc.), moderate limitations in activities of daily living and/or well-being.	Initiation of obesity treatments including considerations of all behavioural, pharmacological and surgical treatment options. Close monitoring and management of comorbidities as indicated.
3	Patient has established end-organ damage such as myocardial infarction, heart failure, diabetic complications, incapacitating osteoarthritis, significant psychopathology, significant functional limitation(s) and/or impairment of well-being.	More intensive obesity treatment including consideration of all behavioural, pharmacological and surgical treatment options. Aggressive management of comorbidities as indicated.
4	Severe (potentially end-stage) disabilities from obesity-related chronic diseases, severe disabling psychopathology, severe functional limitations and/or severe impairment of well being.	Aggressive obesity management as deemed feasible. Palliative measures including pain management, occupational therapy and psychosocial support.

Source: Sharma et al, 2009. International Journal of Obesity (19).

The need for comprehensive support provided to those taking a surgical pathway is unsurprising given that: many individual, social and environmental factors can contribute to the development, maintenance or progression of obesity (2) and reducing hunger through bariatric surgery addresses only one of these factors; significant sustained behaviour change is needed following surgery (22); and surgery-related complications are relatively common (23). The influence of various models of care on the outcomes of bariatric surgery and which models of care confer the greatest health economic benefit needs to be substantiated. Filling these knowledge gaps will benefit the many public health systems providing this service around the world (13) and ideally lead to better care and outcomes for patients. However, the social dimensions potentially influencing the outcomes of bariatric surgery and the likely interwoven nature of the support needs of patients (10, 12), highlights that inputs from outside of the health system (e.g. from industry, other government departments and the general public as recommended for obesity prevention and reduction (24)) will be necessary to maximise patient outcomes. Future research should also evaluate the impact of models of care that focus on quality of life rather than weight reduction for those experiencing long waits for publicly-funded bariatric surgery, given that sustained weight loss is unlikely in this population group and that physiological or psychological health decline appears probable (12, 25-27).

Optimising the provision of bariatric surgery in a public health system is also challenged by other important evidence deficits. For example, health economic analyses of bariatric surgery have generally failed to capture significant health service delivery related costs, such as the relatively common need for re-operations and other aspects of the potential longer term complication profile of bariatric surgery (e.g. excess skin) (28). Further, the recent shift to sleeve gastrectomy (SG) as the preferred procedure in Australia (5, 29) (which follows the

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international trend of an increasing preference for SG – Figure 1 (30)), has occurred in the absence of high quality trial evidence reporting long terms outcomes (31). Another challenge to overcome is that the provision of quality care to those experiencing obesity may be compromised by the common experience of stigma and discrimination directed at patients from health professionals (32). Taken together, more high quality research is needed to optimise service delivery of bariatric surgery. Where evidence is lacking, policy makers can only make pragmatic decisions.

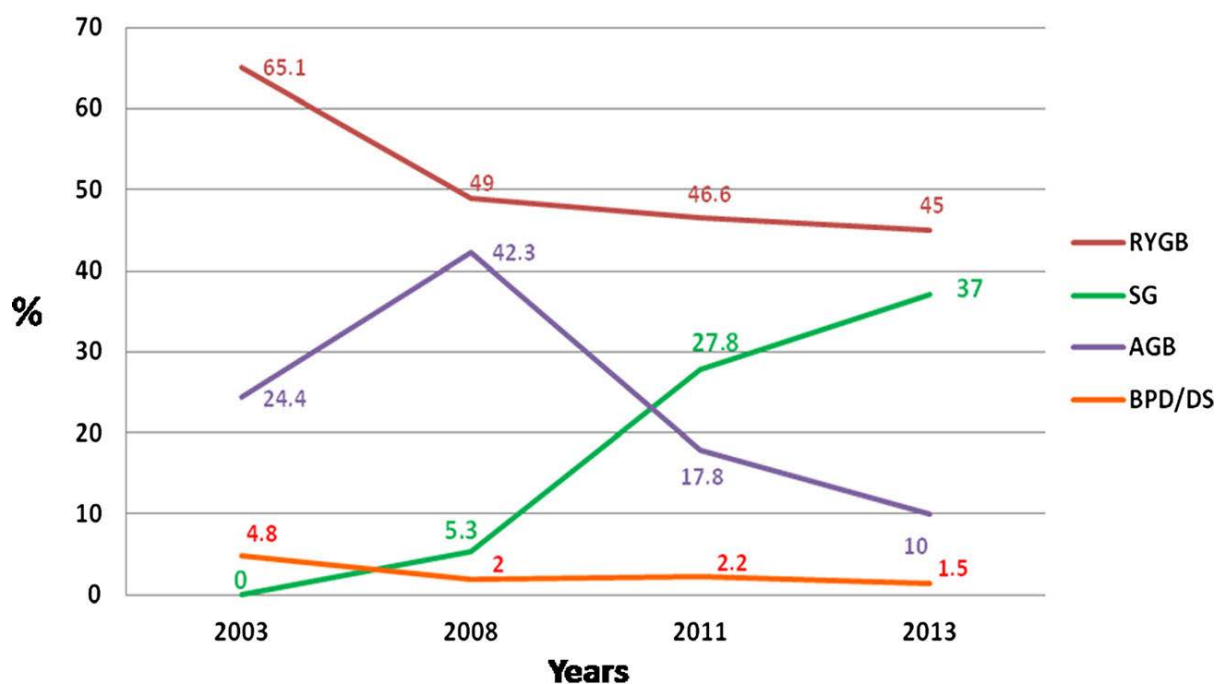


Figure 1: Proportion trends of the four main bariatric surgery procedures conducted internationally from 2003-2013. Key: AGB adjustable gastric banding; BPD/DS biliopancreatic diversion with duodenal switch; RYGB Roux-en-y gastric bypass; SG sleeve gastrectomy. Source: Angrisani et al, 2015. Obesity Surgery.

Limitations

The limitations of the respective studies are described in the manuscripts detailed in Chapters 3-7. The focus group and individual interview studies have provided novel guidance on

important elements to be considered in models of care, but they do not substantiate the relationship between models of care and bariatric surgery outcomes. Further, although it is expected that more comprehensive and contemporary policy making regarding publicly-funded bariatric surgery would confer improved health service delivery and ideally better outcomes for patients, this relationship needs to be substantiated. Taken together, there is a need to evaluate the effectiveness of new policies and models of care.

Research translation

Research translation is an important end of any research. In addition to five publications and many presentations (Appendix 1), the findings of this work have been translated in other ways. For instance, there is evidence that the publication of results from this thesis have influenced policy or practice as summarised:

- Improved support services are now available in Tasmania for both publicly- and privately funded bariatric surgery recipients because of findings from the focus group study (10).
“The Support Needs and Experiences paper has been the most influential so far in my personal practice. Two results have been the escalation of provision of follow up support to patients in northern Tasmania, and the initiation of an exercise support program in Hobart for post bariatric surgery patients, in collaboration with a multidisciplinary health centre” (Dr Stephen Wilkinson, bariatric surgeon, email 23 November 2015).
- Findings from the focus group study also resulted in Tasmanian-wide training for emergency department doctors and general surgery registrars (practicing in either publicly- or privately-funded hospital systems) in the removal of fluid from adjustable gastric bands (9).
- The Government of South Australia used the policy review findings to inform the update of their bariatric surgery guidelines (email from policy officer 4 November 2015). In

2016 this work informed debate and policy development on access criteria for publicly-funded bariatric surgery at the Royal Hobart Hospital Tasmania (initial meeting 20 April 2016).

- Findings regarding the support needs of patients waiting for publicly-funded bariatric surgery will be used to inform health service purchasing arrangements in the Department of Health and Human Services (DHHS), Tasmania (email from policy officer 17 January 2017).

To promote research translation of the findings beyond traditional academic pathways, a knowledge-transfer strategy has been developed (Appendices 3 and 4) informed by the literature (33, 34) and members of the research partnership. This strategy involved determining the key messages from this body of work and for each respective message, identifying the major stakeholders and the most appropriate people to deliver the message, deciding on the best dissemination approach and how to evaluate the presence of an effect (33, 34). Some aspects of the strategy have already been actioned as identified in Appendix 3.

Conclusion

This mixed methods thesis has provided important information for health service planners to guide policy and service delivery of bariatric surgery particularly in Tasmania. Key findings include: more funding of bariatric surgery or other effective interventions for Australians potentially eligible for bariatric surgery is urgently needed because the demand for bariatric surgery in Australia far outstrips supply; guidelines on bariatric surgery are inconsistent and guidance is lacking on key policy areas (e.g. patient prioritisation), which combined have implications for optimal health service planning; people pursuing bariatric surgery have support needs that if addressed may positively impact the outcomes of waiting for or

following surgery; and the uptake of bariatric surgery may be spreading in social networks which will further challenge health service planning as more people seek this intervention. Future research to inform the development of equitable patient prioritisation systems and to determine bariatric surgery models of care that provide the greatest health economic benefit is needed.

References

1. Australian Bureau of Statistics. *Australian Health Survey 2011-2013*, Expanded CURF, RADL. Findings based on use of ABS CURF data. Canberra; 2012.
2. National Health and Medical Research Council. Clinical practice guidelines for the management of overweight and obesity in adults, adolescents and children in Australia. Melbourne; 2013.
3. Sharman MJ, Breslin MC, Kuzminov A, Palmer AJ, Blizzard L, Hensher M, et al. Population estimates and characteristics of Australians potentially eligible for bariatric surgery: findings from the 2011-13 Australian Health Survey. *Aust Health Rev.* 2017.
4. Australian Institute of Health and Welfare. Weight loss surgery in Australia. Cat. no. HSE 91. Canberra; 2010.
5. Medicare. Medicare item numbers 31569, 31572, 31575, processed from June 2015 to July 2016. Canberra; 2017.
6. Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Review of Publicly-Funded Bariatric Surgery Policy in Australia-Lessons for More Comprehensive Policy Making. *Obes Surg.* 2016;26(4):817-24.
7. Mukherjee S, Kamat S, Adegbola S, Agrawal S. Funding for postbariatric body-contouring (barioplastic) surgery in England: a postcode lottery. *Plast Surg Int.* 2014;2014:153194.
8. Sheppard CE, Lester EL, Chuck AW, Birch DW, Karmali S, de Gara CJ. The Economic Impact of Weight Regain. *Gastroenterol Res Pract.* 2013;2013:379564.
9. Sharman M, Hensher M, Wilkinson S, Kuzminov A, Ezzy D, Venn A. Emergency and pre-surgical band deflation in patients with laparoscopic adjustable gastric bands: variations in practice. *ANZ J Surg.* 2015;85(11):890.
10. Sharman M, Hensher M, Wilkinson S, Williams D, Palmer A, Venn A, et al. What are the support experiences and needs of patients who have received bariatric surgery? *Health expectations : an international journal of public participation in health care and health policy.* 2017;20(1):35-46.
11. Sharman MJ, Venn AJ, Hensher M, Wilkinson S, Palmer AJ, Williams D, et al. Motivations for Seeking Bariatric Surgery: The Importance of Health Professionals and Social Networks. *Bariatric surgical practice and patient care.* 2016;11(3):104-9.
12. Sharman MJ, Venn AJ, Jose KA, Williams D, Hensher M, Palmer AJ, et al. The support needs of patients waiting for publicly-funded bariatric surgery – implications for health service planners *Clinical Obesity* 2016 *In press.*
13. International federation for the surgery of obesity and metabolic disorders. First IFSO global registry report. Henley-on-Thames; 2014.
14. Bhogal SK, Reddigan JI, Rotstein OD, Cohen A, Glockler D, Tricco AC, et al. Inequity to the utilization of bariatric surgery: a systematic review and meta-analysis. *Obes Surg.* 2015;25(5):888-99.
15. Christou NV, Efthimiou E. Bariatric surgery waiting times in Canada. *Canadian Journal of Surgery.* 2009;52(3):229-34.
16. Sassi F, ., et al. The Obesity Epidemic: Analysis of Past and Projected Future Trends in Selected OECD Countries: OECD Publishing.
17. Saxena S, Ambler G, Cole TJ, Majeed A. Ethnic group differences in overweight and obese children and young people in England: cross sectional survey. *Arch Dis Child.* 2004;89.

18. Rubino F, Nathan DM, Eckel RH, Schauer PR, Alberti KGMM, Zimmet PZ, et al. Metabolic Surgery in the Treatment Algorithm for Type 2 Diabetes: A Joint Statement by International Diabetes Organizations. *Diabetes Care*. 2016;39(6):861-77.
19. Sharma AM, Kushner RF. A proposed clinical staging system for obesity. *Int J Obes (Lond)*. 2009;33(3):289-95.
20. Mitton C, Donaldson C. Health care priority setting: principles, practice and challenges. *Cost Effectiveness and Resource Allocation*. 2004;2(1):3.
21. Peacock S, Mitton C, Bate A, McCoy B, Donaldson C. Overcoming barriers to priority setting using interdisciplinary methods. *Health Policy*. 2009;92(2):124-32.
22. Karmali S, Brar B, Shi X, Sharma AM, de Gara C, Birch DW. Weight Recidivism Post-Bariatric Surgery: A Systematic Review. *Obes Surg*. 2013;23(11):1922-33.
23. Chang SH, Stoll CR, Song J, Varela JE, Eagon CJ, Colditz GA. The effectiveness and risks of bariatric surgery: an updated systematic review and meta-analysis, 2003-2012. *JAMA Surg*. 2014;149(3):275-87.
24. Roberto CA, Swinburn B, Hawkes C, Huang TTK, Costa SA, Ashe M, et al. Patchy progress on obesity prevention: emerging examples, entrenched barriers, and new thinking. *The Lancet*. 385(9985):2400-9.
25. Brown WA, Burton PR, Shaw K, Smith B, Maffescioni S, Comitti B, et al. A Pre-Hospital Patient Education Program Improves Outcomes of Bariatric Surgery. *Obes Surg*. 2016;26(9):2074-81.
26. Fildes A, Charlton J, Rudisill C, Littlejohns P, Prevost AT, Gulliford MC. Probability of an Obese Person Attaining Normal Body Weight: Cohort Study Using Electronic Health Records. *Am J Public Health*. 2015;105(9):e54-9.
27. Padwal RS, Rueda-Clausen CF, Sharma AM, Agborsangaya CB, Klarenbach S, Birch DW, et al. Weight loss and outcomes in wait-listed, medically managed, and surgically treated patients enrolled in a population-based Bariatric program: prospective cohort study. *Med Care*. 2014;52(3):208-15.
28. Campbell JA, Venn A, Neil A, Hensher M, Sharman M, Palmer AJ. Diverse approaches to the health economic evaluation of bariatric surgery: a comprehensive systematic review. *Obes Rev*. 2016;17(9):850-94.
29. Medicare. Medicare item numbers 30511, 30512, 30518, processed from July 2012 to June 2013. Canberra; 2017.
30. Angrisani L, Santonicola A, Iovino P, Formisano G, Buchwald H, Scopinaro N. Bariatric Surgery Worldwide 2013. *Obes Surg*. 2015;25(10):1822-32.
31. Colquitt JL, Pickett K, Loveman E, Frampton GK. Surgery for weight loss in adults. *Cochrane Database Syst Rev*. 2014(8):Cd003641.
32. Puhl R, Heuer CA. The stigma of obesity: A review and update. *Obesity*. 2009;17(5):941-64.
33. Lavis JN, Robertson D, Woodside JM, McLeod CB, Abelson J. How can research organizations more effectively transfer research knowledge to decision makers? *Milbank Q*. 2003;81(2):221-48, 171-2.
34. Grimshaw JM, Eccles MP, Lavis JN, Hill SJ, Squires JE. Knowledge translation of research findings. *Implementation Science*. 2012;7(1):50.

Appendix 1: Research translation through presentations

Conference oral presentations

Oct 2016: Sharman MJ, Breslin MC, Kuzminov A, Palmer A, Blizzard L, Hensher M, Venn AJ (Presenter). Population estimates and characteristics of Australians potentially eligible for bariatric surgery: findings from the 2011-13 Australian Health Survey. Obesity Surgery Society Australia New Zealand. Sydney, Australia. **Awarded best paper - integrated health.**

June 2016: Sharman MJ, Venn AJ, Hensher M, Wilkinson S, Williams D, Palmer AJ, Ezzy D. Motivations for seeking bariatric surgery – the importance of health professionals and social networks. European Obesity Summit. Gothenburg, Sweden.

Oct 2015: Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Review of Publicly-Funded Bariatric Surgery Policy in Australia-Lessons for More Comprehensive Policy Making. Obesity Surgery Society Australia New Zealand. Hamilton Island, Australia.

Oct 2015: Sharman MJ, Venn AJ, Hensher M, Wilkinson S, Williams D, Palmer AJ, Ezzy D. What are the support experiences and needs of patients who have received bariatric surgery? Obesity Surgery Society Australia New Zealand. Hamilton Island, Australia.

Sept 2015: Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Review of Publicly-Funded Bariatric Surgery Policy in Australia-Lessons for More Comprehensive Policy Making. Population Health Congress. Hobart, Australia.

Sept 2015: Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Review of Publicly-Funded Bariatric Surgery Policy in Australia-Lessons for More Comprehensive Policy Making. Population Health Congress. Hobart, Australia.

Invited presentations

April 2016: Sharman MJ. Review of Publicly-Funded Bariatric Surgery Policy in Australia-Lessons for More Comprehensive Policy Making. Bariatric surgery policy review meeting. Royal Hobart Hospital, Hobart, Australia.

April 2016: Sharman MJ. Nutrition support needs and experiences pre and post bariatric surgery. Public seminar on the support needs of people pre and post bariatric surgery. Menzies Institute for Medical Research, Hobart, Australia.

Aug 2015: Sharman MJ. Why people seek bariatric surgery and what are their support needs after surgery? In-service. Royal Hobart Hospital physiotherapy department, Hobart, Australia.

Other oral presentations

Dec 2015: Sharman MJ. What are the support experiences and needs of patients who have received bariatric surgery? Public health and primary care theme meeting. Menzies Institute for Medical Research, Hobart, Australia.

Oct 2014: Sharman MJ. Publicly funded bariatric surgery in Australia. What guidance is provided by the states and territories? Public health and primary care theme meeting. Menzies Institute for Medical Research, Hobart, Australia.

Poster presentations

June 2016: Sharman MJ, Venn AJ, Jose K, Hensher M, Wilkinson S, Williams D, Palmer AJ, Ezzy D. The experience of waiting for publicly-funded bariatric surgery. European Obesity Summit, Gothenburg, Sweden.

June 2016: Sharman MJ, Kuzminov A, Blizzard L, Hensher M, Palmer AJ, Breslin MC, Venn AJ. Population estimates and characteristics of Australians potentially eligible for bariatric surgery – findings from the 2011-13 Australian Health Survey. European Obesity Summit, Gothenburg, Sweden.

May 2016: Sharman MJ, Breslin M, Kuzminov A, Hensher M, Palmer AJ, Venn AJ. Population estimates and characteristics of Australian adults eligible for bariatric surgery. 13th International Congress on Obesity, Vancouver, Canada.

Oct 2015: Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Review of Publicly-Funded Bariatric Surgery Policy in Australia-Lessons for More Comprehensive Policy Making. Royal Australasian College of Surgeons, Victoria/Tasmania annual meeting. Hobart, Australia. **Awarded best poster.**

Oct 2015: Sharman MJ, Venn AJ, Hensher M, Wilkinson S, Williams D, Palmer AJ, Ezzy D. Motivations for seeking bariatric surgery – the influence of health professionals and social networks. Royal Australasian College of Surgeons. Victoria/Tasmania annual meeting. Hobart, Australia.

Oct 2014: Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Publicly funded

bariatric surgery in Australia. What guidance is provided by the states and territories?

Australia New Zealand Obesity Society annual conference. Sydney, Australia.

Sept 2014: Sharman MJ, Hensher M, Wilkinson S, Campbell JA, Venn AJ. Publicly funded

bariatric surgery in Australia. What guidance is provided by the states and territories?

Graduate Research Conference. University of Tasmania, Hobart, Australia.

Appendix 2: Other related scholarly output external to this thesis

Peer-reviewed publications

Jose KA, Venn A, **Sharman M**, Wilkinson S, Williams D, Ezzy D. Understanding the gendered nature of weight loss surgery: insights from an Australian qualitative study. *Health Sociology Review. In press.*

Campbell JA, Palmer AJ, Venn A, **Sharman M**, Otahal P, Neil A. A Head-to-Head Comparison of the EQ-5D-5L and AQoL-8D Multi-Attribute Utility Instruments in Patients Who Have Previously Undergone Bariatric Surgery. *Patient.* 2016;9(4):311-22.

Campbell JA, Venn A, Neil A, Hensher M, **Sharman M**, Palmer AJ. Diverse approaches to the health economic evaluation of bariatric surgery: a comprehensive systematic review. *Obes Rev.* 2016;17(9):850-94.

Oral conference presentations

Sept 2016: Campbell JA, Ezzy D, Hensher M, Neil A, Venn AJ, **Sharman MJ** and Palmer AJ. A qualitative investigation of the emergence of demand-induced supply for bariatric surgery: diversity of patient perspectives and implications for economic evaluation. Australian Health Economists Conference, Perth, Australia.

May 2016: Jose K, Venn AJ, **Sharman MJ**, Wilkinson S, Williams D, Ezzy D. Understanding gender differences in bariatric surgery: Moving beyond traditional representation and appearance concerns. 13th International Congress on Obesity, Vancouver, Canada

Sept 2015: Campbell JA, Palmer AJ, Venn AJ, **Sharman MJ**, Otahal P, Neil A. A ‘head-to-head’ comparison of the EQ-5D-5L and AQoL-8D multi-attribute utility instruments in patients who have undergone bariatric surgery. Population Health Congress, Hobart, Australia.

Poster conference presentations

Dec 2015: Campbell J, Palmer AJ, Venn AJ, **Sharman MJ**, Otahal P, Neil A. A 'head-to-head' comparison of the EQ-5D-5L and AQoL-8D multi-attribute utility instruments in patients who have undergone bariatric surgery. 9th Health Services and Policy Research Conference, Melbourne, Australia.

Aug 2015: Kuzminov A, Wilkinson S, **Sharman MJ**, Palmer A, Venn A. Secondary bariatric surgery: What follows? A systematic review of patient pathways. International Federation for the Surgery of Obesity and Metabolic Disorders Conference, Vienna, Austria.

Appendix 3: Knowledge-transfer strategy

The following strategy has been informed by the literature (1, 2) and through discussions with members of the investigator team.

Key message	Target audience	Messenger	Message dissemination approach	Actioned (Y)	Desired outcome/effect evaluation
The potential demand for bariatric surgery far exceeds current supply, especially in the public health system and outside major cities.	Australian policy officers responsible for bariatric surgery	Melanie Sharman Professor Alison Venn Martin Hensher (Director, DHHS)	Summary of findings (Appendix 4) Manuscript		Follow up correspondence Policy change
	Australian media	Melanie Sharman Professor Alison Venn	Media release		National and international coverage
	Australian bariatric surgeons	Melanie Sharman Professor Alison Venn	Email manuscript Conference presentations Key findings sent by Obesity Surgery Society Australia and New Zealand		Citations 'Reads' and manuscript requests (ResearchGate) Follow up correspondence (e.g. practice change) Conference awards
	Key Australian scholars in bariatric surgery and obesity research	Melanie Sharman Professor Alison Venn	Email manuscript Conference presentations		Citations 'Reads' and manuscript requests (ResearchGate) Follow up correspondence Conference awards
	Council of Australian Governments	Professor Alison Venn Martin Hensher (Director, DHHS)	Council submission		Follow up correspondence Policy change
	Australian professional bodies with guidelines on bariatric surgery	Melanie Sharman Professor Alison Venn	Email manuscript		Follow up correspondence Guideline change

	<ul style="list-style-type: none"> National health and medical research council Australian medical association Australian Diabetes Society 				
Guidelines on bariatric surgery are highly variable and lack guidance on key policy areas (e.g. prioritisation, re-operations and body contouring), which have implications for optimal health service planning.	Australian policy officers responsible for bariatric surgery	Melanie Sharman Professor Alison Venn Martin Hensher (Director, DHHS)	Summary of findings (Appendix 4) Manuscript	Y	Follow up correspondence Policy change
	Bariatric surgeons conducting publicly-funded surgery	Melanie Sharman Professor Alison Venn	Email manuscript Conference presentations	Y Y	Citations 'Reads' and manuscript requests (ResearchGate) Follow up correspondence Conference awards
	Key scholars in publicly-funded bariatric surgery research	Melanie Sharman Professor Alison Venn	Email manuscript Conference presentations	Y Y	Citations 'Reads' and manuscript requests (ResearchGate) Follow up correspondence Conference awards
The support needs of patients post bariatric surgery appear commonly numerous, diverse and ongoing and if not	Australian policy officers responsible for bariatric surgery	Melanie Sharman Professor Alison Venn Martin Hensher (Director, DHHS)	Summary of findings (Appendix 4) Manuscript	Y	Follow up correspondence Policy change

remediated may impact surgical outcomes.					
	Bariatric surgeons	Melanie Sharman Professor Alison Venn	Email manuscript Conference presentations	Y Y	Citations 'Reads' and manuscript requests (ResearchGate) Follow up correspondence (e.g. practice change) Conference awards
	Key scholars in bariatric surgery and obesity research	Melanie Sharman Professor Alison Venn	Email manuscript Conference presentations	Y Y	Citations 'Reads' and manuscript requests (ResearchGate) Follow up correspondence Conference awards
	Australian allied health professional bodies • Psychology • Dietetics	Melanie Sharman Professor Alison Venn	Email manuscript	Y	Follow up correspondence Information disseminated to members University curricula change
	Tasmanian Dietitians/nutritionists	Melanie Sharman	Tasmanian based seminar	Y	Follow up correspondence (e.g. practice change)
	Participants	Melanie Sharman	Summary letter and Facebook posts		Follow up correspondence. Facebook views. Participation in future studies
The uptake of bariatric surgery may be spreading in social networks, which has growing implications for health service planning as	Australian policy officers responsible for bariatric surgery	Melanie Sharman Professor Alison Venn Martin Hensher (Director, DHHS)	Summary of findings (Appendix 4) Email manuscript	Y	Follow up correspondence Policy change

more people seek this intervention.					
Prolonged waits for bariatric surgery appear to be commonly associated with weight gain and deteriorating physiological or psychological health. Better support and communication about wait list management may improve the outcomes of waiting and confer quality-of-life gains irrespective of weight loss and reductions in wait time.	Australian policy officers responsible for bariatric surgery	Melanie Sharman Professor Alison Venn Martin Hensher (Director, DHHS)	Summary of findings (Appendix 4) Email manuscript		Follow up correspondence Policy change
	Managers of Australian waiting lists	Melanie Sharman Professor Alison Venn Martin Hensher (Director, DHHS)	Email manuscript	Y (TAS)	Policy change
	Bariatric surgeons conducting publicly-funded surgery	Melanie Sharman Professor Alison Venn	Email manuscript Conference presentations	Y Y	Citations 'Reads' and manuscript requests (ResearchGate) Follow up correspondence (e.g. in practice change) Conference awards
	Key scholars in publicly-funded bariatric surgery research	Melanie Sharman Professor Alison Venn	Email manuscript Conference presentations	Y Y	Citations 'Reads' and manuscript requests (ResearchGate) Follow up correspondence

					Conference awards
	Australian surgical leadership groups	Melanie Sharman Professor Alison Venn Martin Hensher (Director, DHHS)	Email manuscript		Follow up correspondence Policy change
	Australian professional bodies with guidelines on bariatric surgery <ul style="list-style-type: none"> National Health and Medical Research Council Australian Medical Association Australian Diabetes Society 	Melanie Sharman Professor Alison Venn	Email manuscript		Follow up correspondence Guideline change
	Australian primary health care networks	Melanie Sharman Professor Alison Venn	Email manuscript		Follow up correspondence Dissemination of information to members Guideline change
	Participants	Melanie Sharman	Summary letter and Facebook posts		Follow up correspondence. Facebook views. Participation in future studies
Emergency department staff may require training in removing fluid from adjustable gastric bands.	Directors of Australian emergency departments	Melanie Sharman Professor Alison Venn Stephen Wilkinson	Email letter to the editor	Y (TAS only)	Follow up correspondence (e.g. training program implemented)

1. Grimshaw JM, Eccles MP, Lavis JN, Hill SJ, Squires JE. Knowledge translation of research findings. *Implementation Science*. 2012;7(1):50.
2. Lavis J, Hammill AC, Gildiner A, McDonagh RJ, Wilson MG, Ross SE, et al. A systematic review of the factors that influence the use of research evidence by public policymakers: Report submitted to the Canadian Population Health Initiative. Canada: Hamilton; 2005.

Appendix 4: Summary of findings – Publicly-funded bariatric surgery

We have been working with the Tasmanian Departments of Health and Human Services and Premier and Cabinet to help address pressing policy issues regarding publicly-funded bariatric surgery. We are halfway through this five-year NHMRC funded partnership project and we wanted to share with you a summary of our key findings to date, that may be helpful to you in your work.

- The potential demand for bariatric surgery (estimated at more than 800,000 adult Australians) far exceeds current supply, especially in the public health system and outside major cities. More resourcing of publicly-funded bariatric surgery or other effective interventions for this population group are needed (1).
- National and jurisdictional level guidance on bariatric surgery is highly variable and guidance is lacking on key policy areas (e.g. patient prioritisation, re-operations and body contouring surgery). These findings have implications for optimal health service planning, especially given the potential demand for this service (2).
- Prolonged waits for bariatric surgery appear to be commonly associated with weight gain and deteriorating physiological or psychological health. Better peer and health professional supports, together with better communication from those managing waiting lists, may improve the experience or outcomes of waiting and confer quality-of-life gains irrespective of weight loss and wait time (3).
- The support needs of patients post bariatric surgery can be numerous, diverse and ongoing and if not remediated may impact surgical outcomes. Psychological, dietetic and peer support appear to be especially important, but infrequently received (4). Models of care that also account for the reasons patients seek a surgical pathway may improve outcomes (5).
- The uptake of bariatric surgery is influenced by social networks, which has growing implications for health service planning as more people seek this intervention (5).
- Some patients with gastric bands may present at emergency departments with complications necessitating band deflation. Clinical staff may require training in removing fluid from a gastric band (6).